# FISHES
# FROM THE SEA-BOTTOM

FROM THE

"MICHAEL SARS" NORTH ATLANTIC DEEP-SEA EXPEDITION 1910

BY

EINAR KOEFOED

BERGEN

QL
621.2
.K64
1927

WITH 6 PLATES AND 55 FIGURES IN THE TEXT

1926

In March 1918 I delivered to the Bergen Museum my manuscript on the fishes from the sea-bottom of the Atlantic Ocean collected during the cruise of S/S "Michael Sars" 1910.

It has not been possible to print it before 1926. Therefore I have now tried to bring the systematic part up to date, but I have not revised the system of the *Macruridæ* according to the synopsis in Gilbert and Hubbs' Report on Japanese Macrouroid fishes collected in 1906, published in Proceedings of U. S. Nat. Mus., vol. 51, 1917.

Bergen, March 1926.

*Einar Koefoed.*

# Introduction.

In "The Depths of the Ocean" by Sir JOHN MURRAY and Dr. JOHAN HJORT, which appeared in 1912, the latter writer gave a preliminary survey of "Fishes from the Sea-bottom". Dr. HJORT himself, being afterwards fully occupied with the administrative duties of his office as Director of Fisheries for Norway, was unable further to continue the work of the Atlantic Expedition, and entrusted the special treatment of the material to my care, for which mark of confidence I beg to express my best thanks.

By way of introduction to the systematic description, some explanatory observations are here given as to the distribution of the species concerned, following the lines laid down in the chapter by Dr. HJORT above referred to, in "The Depths of the Ocean".

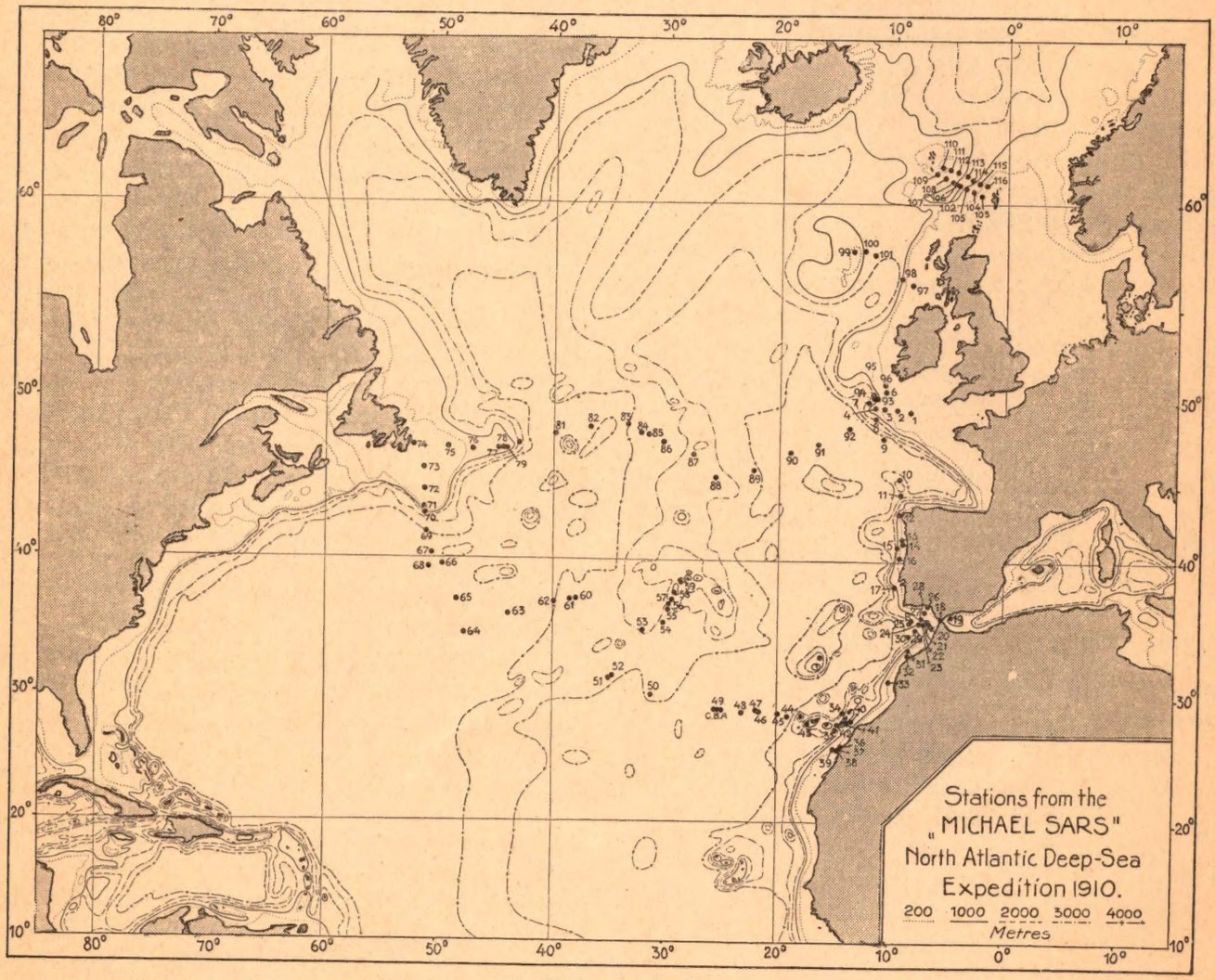



Fig. 1.

Most of the fishes were caught in trawl-hauls made on the bottom, but need not therefore have been actually fished on the bottom itself. BRAUER considers a great number of them as bathypelagic, as for instance all the *Alepocephalidæ* (No. 8 pp. 335—336). It is probable, however, that they were living in the water-layer nearest the bottom, in contrast to fishes only taken at some distance farther up, where only few of the undermentioned species were found, though the young-fish trawl was there employed, as also large nets with about the same aperture in front as the SIEGSBEE trawl used by earlier expeditions.

The temperatures are in this paper always stated as Centigrades.

## Vertical distribution.

In order to give an idea as to the vertical distribution of the species taken, the sea-bottom is divided into four zones:

The abyssal plain below 4000 metres.

An intermediate zone from 4000 to 2600 metres.

The continental slope from 2600 metres to 190 metres.

The continental shelf from 190 metres to the shore.

In the abyssal plain below 4000 metres, amounting to about 75 % of the sea-bottom 2 hauls were made, one at Station 10, one at Station 48.

In these two hauls only 5 fishes were caught belonging to five different species and five genera namely:

| | | |
|---|---|---|
| 1 | of the family | *Alepocephalidæ.* |
| 1 | — | *Scopelidæ.* |
| 2 | — | *Macruridæ.* |
| 1 | — | *Zoarcidæ.* |

In the zone between the abyssal plain and the continental slope from 4000 metres to 2600 metres (nearly 19 % of the ocean-floor) 3 hauls were made on the Stations 35, 53 and 88.

In these three hauls 103 fishes were caught or about 34 per haul belonging to 27 species, 17 genera, viz. in average 4 fishes per species namely:

| | | |
|---|---|---|
| 1 | of the family | *Chimæridæ.* |
| 30 | — | *Alepocephalidæ.* |
| 6 | — | *Synaphobranchidæ.* |
| 1 | — | *Ilyophidæ.* |
| 8 | — | *Scopelidæ.* |
| 3 | — | *Stephanoberycidæ.* |
| 10 | — | *Halosauridæ.* |
| 1 | — | *Notacanthidæ.* |
| 39 | — | *Macruridæ.* |
| 4 | — | *Zoarcidæ.* |

The continental slope is divided into a steepest part from 2000 metres to 800 metres, comprising only abt. 3 % or a little more of the sea-bottom, and a somewhat less steeply shelving upper part, from 800 to 200 metres, amounting to abt. 5 % of the ocean-floor.

On the lowest part of the continental slope, the "Michael Sars" made in 1902 three hauls on the Faroe slope, and in 1910 eight hauls, viz. at Stations 4, 23, 24, 25, 41, 70, 95 and 101. These eleven hauls gave altogether abt. 1238 fish, or abt. 113 per haul. There were 64 species, belonging to 39 genera. Of these, 3 genera, with 17 species, belonged to the family *Macruridæ*, and 3 genera with 9 species to the family *Alepocephalidæ*. On an average, there were 19 fish per species. There is thus here a considerable increase both in the absolute number of specimens and also in the number of individuals within each species when compared with the hauls made in the deep parts below the continental slope.

The distribution of the fish among the various systematic groups is as follows:

| | | | |
|---|---|---|---|
| 20 | *Selachii.* | 569 | *Macruridæ.* |
| 7 | *Batoidei (Raiidæ).* | 408 | *Gadidæ.* |
| 22 | *Chimæridæ.* | 3 | *Berycidæ.* |
| 68 | *Alepocephalidæ.* | 9 | *Acropomatidæ.* |
| 46 | *Synaphobranchidæ.* | 3 | *Scorpænidæ.* |
| 15 | *Scopelidæ.* | 5 | *Cottidæ.* |
| 24 | *Halosauridæ.* | 19 | *Zoarcidæ.* |
| 19 | *Notacanthidæ.* | 1 | *Malthidæ.* |

On the uppermost portion of the continental slope, between 550 and 250 metres, the "Michael Sars" made in 1902 one haul on the Faroe slope, and in 1910 two hauls, viz. at Stations 21 and 39. These three hauls gave 560 fish, or abt. 187 per haul. There were 35 species, belonging to 31 genera, with an average of 16 fish per species. The systematic distribution appears as follows:

| | | | |
|---|---|---|---|
| 65 | *Selachii.* | 251 | *Sparidæ.* |
| Abt. 28 | *Batoidei (Raiidæ).* | 1 | *Mullidæ.* |
| 4 | *Chimæridæ.* | Few | *Caproidæ.* |
| 5 | *Salmonidæ.* | 2 | *Carangidæ.* |
| Many | *Centriscidæ.* | 3 | *Pleuronectidæ.* |
| 18 | *Macruridæ.* | 11 | *Scorpænidæ.* |
| 93 | *Gadidæ.* | Many | *Triglidæ.* |
| 30 | *Berycidæ.* | | |

The continental shelf from 200 metres to the shore makes up abt. 7 % of the ocean-floor.

Here, the "Michael Sars" made in 1902 one haul off the Faroe Islands, and in 1910 seven hauls, viz. at Stations 1, 3, 13—14, 20, 36, 37 and 38. These eight hauls gave altogether abt. 1480 fish or 185 per haul,

There were 69 species belonging to 47 genera, averaging 21 fish per species.

The systematic distribution is as follows:

| | | | |
|---|---|---|---|
| 47 | *Selachii.* | 84 | *Caproidæ.* |
| 63 | *Batoidei.* | 1 | *Labridæ.* |
| 130 | *Clupeidæ.* | 296 | *Carangidæ.* |
| 9 | *Salmonidæ.* | 5 | *Zeidæ.* |
| 1 | *Murænidæ.* | 211 | *Pleuronectidæ.* |
| 32 | *Atherinidæ.* | 7 | *Scorpænidæ.* |
| 206 | *Gadidæ.* | 105 | *Triglidæ.* |
| 3 | *Serranidæ.* | 4 | *Trachinidæ.* |
| 23 | *Sciænidæ.* | 1 | *Uranoscopidæ.* |
| 50 | *Pristipomatidæ.* | 5 | *Callionymidæ.* |
| 174 | *Sparidæ.* | 2 | *Tetrodontidæ.* |
| 12 | *Mullidæ.* | | |

A hasty glance shows that in the deep, the *Alepocephalidæ* and *Macruridæ* predominate; on the lowest part of the continental slope, the *Alepocephalidæ* fall off somewhat, and the *Gadidæ* make their appearance. The *Macruridæ* decrease considerably on the uppermost part of the slope, the *Gadidæ* on the other hand, remaining numerous right up on to the continental shelf. On the uppermost part of the continental slope, they have to share the position with *Acanthopterygii*, especially *Sparidæ*, and on the continental shelf also with *Pleuronectidæ*.

A closer analysis shows this more definitely.

In the intermediate zone between the abyssal plain and the continental slope, at depths between 4000 and 2600 metres, the proportion between the various groups, expressed in percentages, was as follows:

( 1 fish or) 1 per cent belonged to *Holocephali (Chimæridæ).*
(30 fishes „ ) 29 per cent belonged to *Malacopterygii (Alepocephalidæ).*
( 7 „ „ ) 7 per cent belonged to *Apodes* (especially *Synaphobranchidæ).*
(11 „ „ ) 11 per cent belonged to *Haplomi* (especially *Scopelidæ).*
(11 „ „ ) 11 per cent belonged to *Heteromi* (especially *Halosauridæ).*
(39 „ „ ) 38 per cent belonged to *Anacanthini (Macruridæ).*
( 4 „ „ ) 4 per cent belonged to *Acanthopterygii (Zoarcidæ).*

On the deep part of the continental slope, between 2600 and 800 metres, the following percentages were found:

( 49 fishes or) abt. 4 per cent belonged to *Plagiostomi* and *Holocephali.*
( 68 „ „ ) abt. 6 per cent belonged to *Alepocephalidæ.*
( 46 fishes or) abt. 4 per cent belonged to *Synaphobranchidæ.*
( 15 „ „ ) abt. 1 per cent belonged to *Scopelidæ.*
( 43 „ „ ) abt. 3.5 per cent belonged to *Heteromi (Halosauridæ & Notacanthidæ).*
(569 „ „ ) abt. 46 per cent belonged to *Macruridæ.*
(408 „ „ ) abt. 33 per cent belonged to *Gadidæ.*
( 19 „ „ ) abt. 2 per cent belonged to *Zoarcidæ.*

On the uppermost part of the continental slope, between 550 and 250 metres, the following:

( 97 fishes or) 17 per cent belonged to *Plagiostomi* and *Holocephali.*
( 18 „ „ ) 3 per cent belonged to *Macruridæ,*
( 93 „ „ ) 17 per cent belonged to *Gadidæ.*
(290 „ „ ) 52 per cent belonged to *Acanthopterygii perciformes* (espec. *Sparidæ).*
( 2 „ „ ) 0.4 per cent belonged to *Acanthopterygii scombriformes (Carangidæ).*
( 3 „ „ ) 0.5 per cent belonged to *Acanthopterygii zeorhombi (Pleuronectidæ).*
( 60 „ „ ) 11 per cent belonged to *Acanthopterygii scleroparei (Triglidæ).*

In order to gain an idea as to the percentages for the various fishes on the continental shelf, the northern and southern hauls must be taken separately, as the bottom-temperature in the northern area on the Faroe Bank and south of the British Isles lies between 8° and 10°; in the southern area, from Portugal to the Canaries, between 12° and 16°.

South-west of Faroe Islands (1902) and west of British Isles (1910 Sts. 1 & 3) in the depths from 184 to 130 metres 680 fishes were caught. Of these:

( 78 fishes or) abt. 11 per cent belonged to *Plagiostomi.*
( 83 „ „ ) abt. 12 per cent belonged to *Gadidæ.*
( 54 „ „ ) abt. 8 per cent belonged to *Acanthopterygii perciformes (Capros aper).*
(187 „ „ ) abt. 28 per cent belonged to *Acanthopterygii scombriformes (Caranx trachurus).*
(201 „ „ ) abt. 30 per cent belonged to *Acanthopterygii zeorhombi* (espec. *Pleuronectidæ).*
( 65 „ „ ) abt. 10 per cent belonged to *Acanthopterygii scleroparei* (espec. *Triglidæ).*

West of Portugal and Morocco and south of Canary Islands (Stations 13, 14, 20, 36, 37, 38) in the depths from 141 to 10 metres, about 800 fishes were caught. Of these:

( 32 fishes or) abt. 4 per cent belonged to *Plagiostomi.*
(123 „ „ ) abt. 16 per cent belonged to *Gadidæ.*

(293 fishes or) abt. 37 per cent belonged to *Acanthopterygii perciformes* (espec. *Sparidæ*).
(110 „ „ ) abt. 14 per cent belonged to *Acanthopterygii scombriformes* (espec. *Caranx*).
( 15 „ „ ) abt. 2 per cent belonged to *Acanthopterygii zeorhombi* (espec. *Pleuronectidæ*).
( 57 „ „ ) abt. 7 per cent belonged to *Acanthopterygii scleroparei* (espec. *Triglidæ*).

For the sake of completeness, a list is here given of the fishes taken at the different stations.

### The abyssal plain below 4000 metres.

St. 48, over 5000 metres, 28° 54′ N., 24° 14′ W.

1 *Bathytroctes rostratus*, GÜNTH.
1 *Bathymicrops regis*, n. sp.
1 *Dicrolene intronigra*, G. & B.

St. 10, 4700 metres, probable temperature 2°6, 45° 26′ N., 9° 20′ W.

1 *Macrurus (Chalinura) brevibarbis*, G. & B.
1 „ *(Nematonurus) armatus*, HECTOR.

### The intermediate zone 4000 to 2600 metres.

St. 88, 3120 metres, probable temp. 2°5, 45° 26′ N., 25° 45′ W.

2 *Histiobranchus bathybius*, GÜNTH.
1 *Bathysaurus ferox*, GÜNTH.
1 *Halosauropsis macrochir*, GÜNTH.
4 *Macrurus flagellicauda*, n. sp.
3 „ *(Chalinura) brevibarbis*, G. & B.
2 „ „ *simulus*, G. & B.
1 „ *carapinus*, G. & B.
7 „ *(Nematonurus) armatus*, HECTOR.
1 *Neobythites crassus*, VAILL.

St. 53, 2615—2865 metres, 34° 59′ N., 33° 1′ W.

1 *Alepocephalus hjorti*, n. sp.
19 *Bathytroctes alvifrons*, GARMAN.
4 „ *michaelsarsi*, n. sp.
4 *Histiobranchus bathybius*, GÜNTH.
1 *Ilyophis brunneus*, GILB.
1 *Bathysaurus ferox*, GÜNTH.
1 „ *mollis*, GÜNTH.
2 *Bathypteroïs longipes*, GÜNTH.
2 *Benthosaurus grallator*, G. & B.
1 *Stephanoberyx gillii*, G. & B.
7 *Halosauropsis macrochir*, GÜNTH.
1 *Macdonaldia*, sp.
5 *Macrurus (Chalinura) simulus*, G. & B.
6 „ *carapinus*, G. & B.
8 „ *(Nematonurus) armatus*, HECTOR.
1 *Mixonus laticeps*, GÜNTH.

St. 35, 2603 metres, 27° 27′ N., 14°52 W.

1 *Harriotta raleighana*, G. & B.
2 *Alepocephalus australis*, BARNARD?
2 „ *murrayi*, n. sp.
1 *Bathytroctes nasutus*, n. sp.
1 *Platytroctes apus*, GÜNTH.
1 *Bathysaurus ferox*, GÜNTH.
2 *Stephanoberyx gillii*, G. & B.
2 *Halosauropsis macrochir*, GÜNTH.
1 *Macrurus güntheri*, VAILL.
1 „ *carapinus*, G. & B.
1 „ *(Nematonurus) armatus*, HECTOR.
1 *Holcomycteronus digittatus*, GARMAN.
1 *Acanthonus armatus*, GÜNTH.

### The continental slope 2600 to 190 metres.

#### I. From 2000 to 800 metres.

St. 25, 2055 metres, probable temp. 3°0. 35° 46′ N., 8° 16′ W.

1 *Spinax princeps*, COLL.
1 *Raia fyllæ*, LTK.
1 *Alepocephalus productus*, GILL.
1 „ *macropterus*, VAILL.
1 „ *murrayi*, n. sp.
2 *Narcetes pluriserialis*, GARMAN.
11 *Talismania mollis*, KOEHLER.
1 *Bathysaurus ferox*, GÜNTH.
5 *Halosauropsis macrochir*, GÜNTH.
1 *Macrurus sclerorhynchus*, VAL.
5 „ *güntheri*, VAILL.
1 „ *(Chalinura) murrayi*, GÜNTH.
1 *Antimora rostrata*, GÜNTH.
1 *Neobythites crassus*, VAILL.

St. 101, 1853 metres, probable temp. 3°2. 57° 41′ N., 11° 48′ W.

2 *Harriotta raleighana*, G. & B.
3 *Alepocephalus agassizii*, G. & B.
3 *Synaphobranchus pinnatus*, GRON.
66 *Macrurus güntheri*, VAILL.
2 „ *(Chalinura) murrayi*, GÜNTH.
1 „ „ *brevibarbis*, G. & B.
16 *Antimora rostrata*, GÜNTH.
1 *Lepidion eques*, GÜNTH.

St. 95, 1797 metres, 50° 22′ N., 11° 44′ W.

2 *Raia fyllæ*, Ltk.
2 *Alepocephalus agassizii*, G. & B.
1 „ *australis*, Barnard?
1 „ *macropterus*, Vaill.
1 *Narcetes pluriserialis*, Garman.
2 *Synaphobranchus pinnatus*, Gron.
3 *Bathysaurus ferox*, Günth.
3 *Halosauropsis macrochir*, Günth.
1 *Notacanthus*, sp.
1 *Macdonaldia rostrata*, Coll.
30 *Macrurus güntheri*, Vaill.
5 „ *(Chalinura) murrayi*, Günth.
14 *Antimora rostrata*, Günth.
11 *Neobythites crassus*, Vaill.

St. 24, 1615 metres, probable temp. 6°6.
35° 34′ N., 7° 35′ W.

1 *Alepocephalus rostratus*, Risso.
3 „ *giardi*, Koehler.
5 „ *macropterus*, Vaill.
7 *Talismania mollis*, Koehler.
3 *Synaphobranchus pinnatus*, Gron.
1 *Macrurus (Coelorhynchus) talismani*, Coll.
1 *Bathygadus favosus?* G. & B.
1 „ *longifilis*, G. & B.

St. 41, 1365 metres, 28° 8′ N., 13° 35′ W.

1 *Scylliorhinus atlanticus*, n. sp.
5 *Alepocephalus rostratus*, Risso.
2 „ *giardi*, Koehler.
2 „ *macropterus*, Vaill.
15 *Synaphobranchus pinnatus*, Gron.
10 *Bathypteroïs dubius*, Vaill.
7 *Macrurus (Coelorhynchus) talismani*, Coll.
2 „ *æqualis*, Günth.
4 „ *zaniophorus*, Vaill.
2 „ *asperrimus*, Vaill.
2 „ *(Cetonurus)*, sp.
16 *Bathygadus melanobranchus*, Vaill.
1 „ *arcuatus*, G. & B.
2 „ *longifilis*, G. & B.
4 *Mora mora*, Risso.
1 *Cottunculus thomsonii*, Günth.
1 *Catætyx laticeps*, n. sp.
2 *Monomitopus torvus*, Garman.

St. 23, 1215 metres, probable temp. 9°8.
35° 32′ N., 7° 7′ W.

5 *Alepocephalus rostratus*, Risso.
1 „ *giardi*, Koehler.
16 *Synaphobranchus pinnatus*, Gron.
1 *Bathypteroïs dubius*, Vaill.
16 *Halosaurus johnsonianus*, Vaill.
19 *Trachyrhynchus trachyrhynchus*, Risso.
5 *Macrurus æqualis*, Günth.
2 *Bathygadus melanobranchus*, Vaill.
1 „ *arcuatus*, G. & B.
2 „ *longifilis*, G. & B.
36 *Mora mora*, Risso.
1 *Oculospinus brevis*, n. sp.

Year 1902, 1073 metres, temp. 8°07. St. 76 b
59° 23′ N., 7° 50′ W. Faroe slope.

2 *Spinax princeps*, Coll.
1 *Centroscyllium fabricii*, Reinh.
8 *Chimæra mirabilis*, Coll.
3 *Alepocephalus giardi*, Koehler.
2 *Synaphobranchus pinnatus*, Gron.
24 *Trachyrhynchus murrayi*, Günth.
53 *Macrurus (Coelorhynchus) talismani*, Coll.
„ *güntheri*, Vaill.
„ *(Coryphænoides) rupestris*, Gunn.
5 *Halargyreus affinis*, Coll.
24 *Lepidion eques*, Günth.
4 *Cottunculus thomsonii*, Günth.

Year 1902, 1060 metres, temp. 8°07.
59° 28′ N., 8° 1′ W. Faroe slope. St. 76
1 *Centroscyllium fabricii*, Reinh.
2 *Raia* sp.
1 *Chimæra mirabilis*, Coll.
1 *Alepocephalus giardi*, Koehler.
1 *Synaphobranchus pinnatus*, Gron.
1 *Notacanthus bonapartii*, Risso.
15 *Trachyrhynchus murrayi*, Günth.
*Macrurus (Coelorhynchus) talismani*, Coll.
„ *güntheri*, Vaill
„ *(Coryphænoides) rupestris*, Gunn.
7 *Halargyreus affinis*, Coll.
16 *Lepidion eques*, Günth.

St. 4, 923 metres, probable temp. 8°5.
49° 38′ N., 11° 35′ W.

1 *Raia nidrosiensis*, Coll.
7 *Chimæra mirabilis*, Coll.
7 *Alepocephalus rostratus*, Risso.
1 „ *giardi*, Koehler.
3 *Synaphobranchus pinnatus*, Gron.
1 *Macdonaldia rostrata*, Coll.
16 *Trachyrhynchus trachyrhynchus*, Risso.

7 *Macrurus (Coelorhynchus) talismani*, COLL.
160 „ *æqualis*, GÜNTH.
4 „ *(Coryphænoides) rupestris*, GUNN.
1 *Phycis blennioides*, BRÜNN.
70 *Mora mora*, RISSO.
Abt. 40 *Lepidion eques*, GÜNTH.
3 *Hoplostethus mediterraneum*, CUV. & VAL.
3 *Scorpæna cristulata*, G. & B.

Year 1902, 831 metres, 61° 7′ N., 9° 33′ W. Faroe slope.

14 *Centrophorus squamosus*, GMEL.
„ *calceus*, LOWE.
„ *crepidater*, BOC. & CAP.
„ *coelolepis*, BOC. & CAP.
*Spinax princeps*, COLL.
*Centroscyllium fabricii*, REINH.
1 *Raia* sp.
4 *Chimæra mirabilis*, COLL.
1 *Alepocephalus giardi*, KOEHLER.
1 *Synaphobranchus pinnatus*, GRON.
15 *Notacanthus bonapartii*, RISSO.
1 *Trachyrhynchus murrayi*, GÜNTH.
74 *Macrurus (Coelorhynchus) talismani*, COLL.
„ *güntheri*, VAILL.
„ *(Coryphænoides) rupestris*, GUNN.
6 *Molva byrkelange*, WALB.
94 *Halargyreus affinis*, COLL.
73 *Lepidion eques*, GÜNTH.

**II. From 800 to 190 metres.**

St. 21, 535 metres, probable temp. 11°1. 35° 31′ N., 6° 35′ W.

11 *Pristiurus melanostomus*, BONAP.
2 *Spinax niger*, BONAP.
1 *Raia fullonica*, LIN.
2 *Chimæra monstrosa*, LIN.
9 *Macrurus (Coelorhynchus) coelorhynchus*, RISSO.
9 „ *(Malacocephalus) lævis*, LOWE.
14 *Gadiculus argenteus*, GUICHENOT.
1 *Molva elongata*, RISSO.
8 *Merluccius vulgaris*, FLEM.
12 *Phycis blennioides*, BRÜNN.
30 *Hoplostethus mediterraneum*, CUV. & VAL.
1 *Lepidorhombus boscii*, RISSO.
Abt. 10 *Sebastes dactylopterus*, DE LA ROCHE.

Year 1902, 442 metres, temp. 7°59. 170 kilomet. south-west of Faroe Islands (long-line).

40 *Pristiurus melanostomus*, BONAP.
3 *Centrophorus sqamosus*, GMEL.
1 *Spinax niger*, BONAP.
2 *Chimæra monstrosa*, LIN.
40 *Brosmius brosme*, ASCAN.
8 *Molva molva*, LIN.
2 *Hippoglossus vulgaris*, FLEM.

St. 39, 267—280 metres, probable temp. 16°2. 26° 3′ N., 15° 0′ W.

1 *Scylliorhinus canicula*, LIN.
5 *Squalus acanthias*, LIN.
2 *Rhina squatina*, DUMERIL.
Some small *Raia clavata*, LIN.
4 *Raia punctata*, RISSO.
20 „ *miraletus*, LIN.
1 „ *circularis*, COUCH.
5 *Argentina silus*, NILSS.
Many *Centriscus scolopax*, LIN.
10 *Merluccius vulgaris*, FLEM.
250 *Dentex macrophthalmus*, CUV. & VAL.
1 *Pagrus vulgaris*, CUV. & VAL.
1 *Mullus surmuletus*, LIN.
Few *Capros aper*, LACÉP.
2 *Caranx trachurus*, LIN.
1 *Scorpæna ustulata*, LOWE.
1 *Trigla lyra*, LIN.
Many *Lepidotrigla aspera*, CUV. & VAL.
1 *Peristedion cataphractum*, CUV. & VAL.

**On the continental shelf down to ca. 180 metres. 1910.**

| West of British Islands | West of Portugal and Morocco | South of Canary Islands |
|---|---|---|
| Off **Faroe Islands**, 130 metres (trawl and long-line) | **Stations 13** and **14**, 70—80 metres (trawl and line) prob. temp. 11°7 | **Station 36**, 10 metres (seine) prob. temp. 15°7 |
| 2 *Gadus æglefinus* | 8 *Gadus merlangus* | 5 *Merluccius vulgaris* |
| 12 *Hippoglossus vulgaris* | 36 „ *luscus* | 1 *Solea lutea* |
| 6 *Pleuronectes limanda* | 22 *Merluccius vulgaris* | 100 *Caranx trachurus* |
| 1 *Zeugopterus megastoma* | 1 *Caranx trachurus* | 1 *Temnodon saltator* |
| 1 *Raia clavata* | 1 *Pagellus centrodontus* | 2 *Sciæna aquila* |
| 9 „ *batis* | | 21 *Umbrina ronchus* |

| West of British Islands | West of Portugal and Morocco | South of Canary Islands |
|---|---|---|
| **Station 1,** 146 metres (trawl) prob. temp. 9°5 | 3 *Trachinus vipera* | Many *Pristipoma bennettii* |
| 2 *Gadus esmarki* | 1 *Scylliorhinus canicula* | „ *Sargus annularis* |
| 2 „ *poutassou* | 1 *Mustelus vulgaris* | 2 *Box vulgaris* |
| 20 *Merluccius vulgaris* | 1 *Oxynotus centrina* | 32 *Atherina presbyter* |
| 2 *Phycis blennioides* | Some *Raia clavata* | 1 *Clupea alosa* |
| 4 *Lepidorhombus megastoma* | „ „ *circularis* | Many „ *pilchardus* |
| 1 *Zeus faber* | **Station 20,** 141 metres (trawl) prob. temp. 12°9 | 27 *Sardinella granigera* |
| 184 *Caranx trachurus* | 52 *Merluccius vulgaris* | Many *Engraulis encrasicholus* |
| 52 *Capros aper* | 1 *Solea vulgaris* | 1 *Myliobatis aquila* |
| 18 *Trigla gurnardus* | 4 *Zeus faber* | **Station 37,** 39 metres (trawl) prob. temp. 15°6 |
| 5 *Argentina sphyræna* | 8 *Caranx trachurus* | 1 *Arnoglossus imperialis* |
| 1 *Pristiurus melanostomus* | 30 *Capros aper* | 3 *Serranus cabrilla* |
| 20 *Squalus acanthias* | 5 *Dentex macrophthalmus* | 1 *Coris julis* |
| 7 *Raia clavata* | 3 „ *maroccanus* | 1 *Dentex maroccanus* |
| **Station 3,** 184 metres (trawl) prob. temp. 10°3 | 7 *Pagellus centrodontus* | 2 *Cantharus lineatus* |
| 1 *Gadus æglefinus* | 1 „ *acarne* | 1 *Mullus surmuletus* |
| 8 „ *poutassou* | 11 *Mullus surmuletus* | 4 *Scorpæna scrofa* |
| 40 *Gadiculus thori* | 2 *Trigla pini* | 2 „ *ustulata* |
| 5 *Merluccius vulgaris* | 1 „ *hirundo* | 1 *Uranoscopus scaber* |
| 1 *Phycis blennioides* | 16 „ *lyra* | 2 *Tetrodon spengleri* |
| 2 *Arnoglossus laterna* | 3 „ *cuculus* | 2 *Raia punctata* |
| 2 „ *imperialis* | 20 *Lepidotrigla aspera* | 2 „ *microocellata* |
| 170 *Lepidorhombus megastoma* | 1 *Peristedion cataphractum* | 1 „ *alba* |
| 3 *Solea variegata* | 6 *Scylliorhinus canicula* | **Station 38,** 77 metres (trawl) prob. temp. 15°7 |
| 2 *Caranx trachurus* | 4 *Squalus acanthias* | 2 *Arnoglossus imperialis* |
| 2 *Capros aper* | 1 *Raia clavata* | 1 „ *thori* |
| 1 *Trigla pini* | | 3 *Solea vulgaris* |
| 12 „ *gurnardus* | | 2 „ *lutea* |
| 29 „ *lyra* | | 1 *Dentex macrophthalmus* |
| 5 *Callionymus maculatus* | | 1 *Pagrus vulgaris* (on line) |
| 4 *Argentina sphyræna* | | 1 *Scorpæna scrofa* |
| 4 *Lophius piscatorius* | | 2 *Trigla obscura* |
| 5 *Scylliorhinus canicula* | | 1 *Trachinus draco* |
| 8 *Squalus acanthias* | | 1 *Murœna helena* |
| 25 *Raia clavata* | | 2 *Raia punctata* |
| 1 „ *circularis* | | |
| 1 „ *vomer* | | |

In the foregoing, attention has only been paid to the distribution of the various systematical groups in the differerent areas of the sea-floor according to depth, save in the case of the continental shelf, where the difference in temperature between north and south was also taken into consideration.

On glancing at the station lists, where the temperatures are noted according to figures given by Professor HELLAND-HANSEN, we find on the continental shelf a complete division of the separate species into northern and southern forms, and it will be noticed that the difference in temperature between north and south makes itself felt already on the upper section of the continental slope, between 500 and 200 metres. It will also be seen that the decline of the temperature towards deeper water is accompanied by differences in the occurrence of the species within the various systematical groups.

The following species, for instance, are not found below 1800 metres where the temperature falls below 3°:

The various species of *Centrophorus*. *Chimœra mirabilis*. *Alepocephalus giardi*. *Trachyrhynchus trachyrhynchus* and *murrayi*, *Macrurus æqualis* and *zaniophorus*, *Bathygadus melanobranchus* and *longifilis*. *Mora mora*, *Halargyreus affinis* and *Lepidion eques*.

On the uppermost part of the continental slope, between 500 and 200 metres, we particularly note *Brosmius brosme* at the northern station, in contrast to *Merluccius vulgaris* at the southern ones, and to the numerous *Sparidæ* at the southernmost station.

Finally, a survey is given showing the different vertical distribution of the various species in the abyssals and on the deepest part of the continental slope, as compared with earlier records, chiefly from Professor BRAUER's comparative survey in his work: "Die Tiefsee-Fische", in the publications of the "Valdivia" Expedition (No. 8, pp. 365—410). The species regarded by BRAUER as bathypelagic are marked "p".

## Vertical distribution of fishes from the abyssal plain.

**Only known from the abyssals.**

*Bathymicrops regis:* "M. S." above 5000 metres.

**Also on the slopes.**

*Macrurus (Chalinura) brevibarbis:* "M. S." 1853—4700 metres, others 1820—3100 metres.

*Macrurus (Nematonurus) armatus:* "M. S." 2603—4700 metres, others 731—4432 metres.

*Dicrolene intronigra:* "M. S." above 5000 metres, others 847—1796 metres.

## Vertical distribution of fishes from zone between abyssal plain and continental slope 2600—4000 metres.

| | | | | | | |
|---|---|---|---|---|---|---|
| *Harriotta raleighana* | "M. S." | 1853—2603 | metres; | others | 1293—1976 | metres |
| *Alepocephalus australis* | „ | 1797—2603 | „ | | | |
| „ *murrayi* | „ | 2055—2603 | „ | | | |
| „ *hjorti* | „ | 2615—2865 | „ | | | |
| *Bathytroctes alvifrons* | „ | 2615—2865 | „ | „ | 2485—3278 „ | p |
| „ *michaelsarsi* | „ | 2615—2865 | „ | | | |
| „ *nasutus* | „ | 2603 | „ | | | |
| *Platytroctes apus* | „ | 2603 | „ | „ | 1786—2742 „ | p (Roule No. 79 b, pag. 12) |
| *Histiobranchus bathybius* | „ | 2615—3120 | „ | „ | 2513—3749 „ | |
| *Ilyophis brunneus* | „ | 2615—2865 | „ | „ | 1158 „ | |
| *Bathysaurus ferox* | „ | 1797—3120 | „ | „ | 1798—3032 „ | p |
| „ *mollis* | „ | 2615—2865 | „ | „ | 3428—4360 „ | p bottom 3655 |
| *Bathypterois longipes* | „ | 2615—2865 | „ | „ | 4844 „ | p |
| *Benthosaurus grallator* | „ | 2615—2865 | „ | „ | 2809—3382 „ | p |
| *Stephanoberyx gillii* | „ | 2603—2865 | „ | „ | 2248—5393 „ | p |
| *Halosauropsis macrochir* | „ | 1797—3120 | „ | „ | 1183—2995 „ | |
| *Macdonaldia sp.* | „ | 2615—2865 | „ | | | |
| *Macrurus güntheri* | „ | 1060—2603 | „ | „ | 1200—2200 „ | |
| „ *flagellicauda* | „ | 3120 | „ | | | |
| „ *(Chalinura) simulus* | „ | 2615—3120 | „ | „ | 605—2250 „ | |
| „ „ *brevibarbis* | „ | 1853—4700 | „ | „ | 1820—3100 „ | |
| „ „ *carapinus* | „ | 2603—3120 | „ | „ | 1200—2640 „ | |
| *Macrurus (Nematonurus) armatus* | „ | 2603—4700 | „ | „ | 731—4432 „ | |
| *Neobythites crassus* | „ | 1797—3120 | „ | „ | 4255 „ | |
| *Mixonus laticeps* | „ | 2615—2865 | „ | „ | 3200—4570 „ | |
| *Holcomycteronus digittatus* | „ | 2603 | „ | „ | 2903—3714 „ | |
| *Acanthonus armatus* | „ | 2603 | „ | „ | 1919—1956 „ | |

**Confined to the abyssals.**

*Alepocephalus murrayi.*
„ *hjorti.*
*Bathytroctes alvifrons* p
„ *nasutus.*
„ *michaelsarsi.*
*Histiobranchus bathybius.*
*Bathysaurus mollis* p

*Bathypterois longipes* p
*Benthosaurus grallator* p
*Stephanoberyx gillii* p
*Macdonaldia sp.*
*Macrurus flagellicauda.*
*Mixonus laticeps.*
*Holcomycteronus digittatus.*
*Acanthonus armatus.*

**Also on the slopes.**

*Harriotta raleighana.*
*Alepocephalus australis*
*Platytroctes apus* p
*Ilyophis brunneus.*
*Bathysaurus ferox* p
*Halosauropsis macrochir.*
*Macrurus güntheri.*
„ *(Chalinura) simulus.*
„ „ *brevibarbis.*
„ „ *carapinus.*
„ *(Nematonurus) armatus.*
*Neobythites crassus.*

## Vertical distribution of fishes on the continental slope between 800 and 2600 metres.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Scylliorhinus atlanticus* ..... | "M. S." | 1365 metres. | | | | | |
| *Pristiurus murinus*..... | „ | 1100—1300 metres; others 1147—1248 metres (Holt & Byrne No. 48, pag. 51) | | | | | |
| *Centrophorus crepidater*..... | „ | 750—831 | „ | | | | |
| „ *squamosus* ..... | „ | 390—831 | „ | „ | 446 | „ | |
| „ *calceus*..... | „ | 750—831 | „ | „ | 1230 | „ | |
| „ *coelolepis*..... | „ | 750—831 | „ | | | | |
| *Spinax princeps*..... | „ | 750—2055 | „ | | | | |
| *Centroscyllium fabricii* ..... | „ | 831—1073 | „ | „ | 1495 | „ | |
| *Raia fyllæ* ..... | „ | 1797—2055 | „ | „ | 778—1064 | „ | |
| „ *vomer* ..... | „ | 184—831 | „ | „ | 45—685 | „ | |
| „ *nidrosiensis* ..... | „ | 923 | „ | | | | |
| *Chimæra mirabilis*..... | „ | 750—1200 | „ | „ | 470—1679 | „ | (Holt & Byrne No. 49, pag. 17) |
| *Harriotta raleighana*..... | „ | 1853—2603 | „ | „ | 1293—1976 | „ | |
| *Alepocephalus rostratus* ..... | „ | 923—1615 | „ | „ | 830—3655 | „ | p |
| „ *giardi*..... | „ | 750—1615 | „ | „ | 800—1410 | „ | p |
| „ *agassizii*..... | „ | 1797—1853 | „ | „ | 983—2022 | „ | p |
| „ *productus*..... | „ | 2055 | „ | „ | 2492 | „ | p |
| „ *australis?*..... | „ | 1797—2603 | „ | „ | 1153 | „ | (Barnard No. 2 a, pag. 441) |
| „ *macropterus*..... | „ | 1365—2055 | „ | „ | 124—2115 | „ | p |
| „ *murrayi* ..... | „ | 2055—2603 | „ | | | | |
| *Narcetes pluriserialis* ..... | „ | 1797—2055 | „ | „ | 1847 | „ | p |
| *Talismania mollis* ..... | „ | 1615—2055 | „ | „ | 1700—1805 | „ | (Koehler No. 57, pag. 517) (Roule No. 79 c, pag. 6) |
| *Synaphobranchus pinnatus* ..... | „ | 923—1853 | „ | „ | 195—3200 | „ | |
| *Bathysaurus ferox* ..... | „ | 1797—3120 | „ | „ | 1798—3032 | „ | p |
| *Bathypterois dubius*..... | „ | 1215—1365 | „ | „ | 834—1635 | „ | p |
| *Halosauropsis macrochir*..... | „ | 1797—3120 | „ | „ | 1183—2995 | „ | |
| *Hulosaurus johnsonianus*..... | „ | 1215 | „ | „ | 834—2115 | „ | |
| *Notacanthus bonapartii*..... | „ | 840—1060 | „ | „ | 840—1495 | „ | |
| „ *sp*..... ..... | „ | 1797 | „ | | | | |
| *Macdonaldia rostrata* ..... | „ | 923—1797 | „ | „ | 1267 | „ | |
| *Trachyrhynchus trachyrhynchus* . | „ | 923—1215 | „ | „ | 405—1495 | „ | (Vaillant No. 86, pag. 253) |
| | | | | | about 600 | „ | (Vinciguerra No. 88, pag. 619) |
| | | | | | 658—752 | „ | (Holt & Byrne No. 47, pag. 24) |
| „ *murrayi*..... | „ | 840—1073 | „ | „ | 1015 | „ | |
| *Macrurus (Coelorhynchus) talismani* | „ | 923—1615 | „ | „ | 460—2200 | „ | |
| „ *sclerorhynchus*..... | „ | 2055 | „ | „ | 550—3655 | „ | |
| „ *æqualis* ..... | „ | 750—1365 | „ | „ | 460—1410 | „ | |
| „ *zaniophorus*..... | „ | 1365 | „ | „ | 830—1350 | „ | |
| „ *güntheri*..... | „ | 1060—2603 | „ | „ | 1200—2200 | „ | |
| „ *(Coryphænoides) rupestris* | „ | 750—1100 | „ | „ | 155—2200 | „ | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Macrurus asperrimus* | "M. S." | 1365 | metres; others 1098—1590 metres | | | | (Roule No. 79 b, pag. 22) |
| „ *(Cetonurus) sp.* | „ | 1365 | „ | | | | |
| „ *(Chalinura) brevibarbis* | „ | 1853—4700 | „ | „ | 1820—3100 | „ | |
| „ „ *murrayi* | „ | 1797—2055 | „ | „ | 877—2010 | „ | |
| *Bathygadus melanobranchus* | „ | 1215—1365 | „ | „ | 259—1557 | „ | |
| „ *sp. (favosus?)* | „ | 1615 | „ | „ | 768—2744 | „ | |
| „ *arcuatus* | „ | 1215—1365 | „ | „ | 610—870 | „ | |
| „ *longifilis* | „ | 1215—1615 | „ | „ | 839—1635 | „ | |
| *Antimora rostrata* | „ | 1797—2055 | „ | „ | 559—2621 | „ | |
| *Halargyreus affinis* | „ | 750—1073 | „ | „ | 987—1128 | „ | (Holt & Byrne No. 48, pag. 58) |
| *Phycis blennioides* | „ | 146—923 | „ | „ | 370—460 | „ | |
| *Mora mora* | „ | 750—1365 | „ | „ | 658—940 | „ | (Holt & Calderwood No. 46 b, pag. 437) (Holt & Byrne No. 47, pag. 24) |
| *Lepidion eques* | „ | 750—1853 | „ | „ | 568—1410 | „ | (Koehler No. 57, pag. 487) |
| *Hoplostethus mediterraneum* | „ | 535—923 | „ | „ | 140—1435 | „ | p |
| *Epigonus telescopus* | „ | 750 | „ | „ | 410—975 | „ | p |
| *Scorpæna cristulata* | „ | 923 | „ | „ | 470—1504 | „ | (Holt & Byrne No. 48, pag. 25) |
| *Cottunculus thomsonii* | „ | 1200—1365 | „ | „ | 191—1568 | „ | |
| *Neobythites crassus* | „ | 1797—3120 | „ | „ | 4255 | „ | |
| *Lycodes terræ novæ?* | „ | 1100 | „ | „ | 155 | „ | (Collett No. 13 b, pag. 54) |
| *Lycodonus mirabilis* | „ | 1100 | „ | „ | 1428—2294 | „ | |
| *Catætyx laticeps* | „ | 1365 | „ | | | | |
| *Monomitopus torvus* | „ | 1365 | „ | „ | 836—1014 | „ | |
| *Oculospinus brevis* | „ | 1215 | „ | | | | |
| *Dibranchus atlanticus* | „ | 1100 | „ | „ | 135—1300 | „ | (Goode & Bean No. 37, pag. 502) (Roule No. 79 b, pag. 26) |

Of the fishes from the slope between 800 and 2600 metres the following species are captured: —

**Also in deeper water.**

*Alepocephalus rostratus* p
*Synaphobranchus pinnatus.*
*Bathysaurus ferox* p
*Halosauropsis macrochir.*
*Macrurus sclerorhynchus.*
„ *(Chalinura) brevibarbis.*
*Neobythites crassus.*

**Also in shallower water.**

*Centrophorus squamosus.*
*Raia vomer.*
*Chimæra mirabilis.*
*Alepocephalus macropterus* p
*Synaphobranchus pinnatus.*
*Trachyrhynchus trachyrhynchus.*
*Macrurus (Coelorhynchus) talismani.*
*Macrurus sclerorhynchus.*
„ *æqualis.*
„ *(Coryphænoides) rupestris.*
*Bathygadus melanobranchus.*
„ *arcuatus.*
*Antimora rostrata.*
*Phycis blennioides.*
*Lepidion eques.*
*Hoplostethus mediterraneum* p
*Epigonus telescopus* p
*Cottunculus thomsonii.*
*Dibranchus atlanticus.*

## Horizontal distribution.

From the tables for horizontal distribution, it will be seen that the fishes on the abyssal plain and in the bordering intermediate zone are cosmopolitan, which stands in correlation to the uniformity prevailing in respect of temperature and nature of bottom.

Also on the deepest part of the continental slope, however, below 800 metres, we find fishes which occur in different oceans, their horizontal distribution falling within the same limits of temperature as their vertical occurrence. Thus *Bathygadus longifilis,* for instance, occurs in the Gulf of Mexico, west and east of Africa, in the Arabian Sea, the Bay of Bengal, west of Sumatra and at the Philippines. The temperature chart for 1000 metres' depth Pl. XVII in Schott's Oceanography of the German Deep-Sea Expedition, shows for these areas tem-

peratures between 5° and 10°—which is just the same difference of temperature as found between Stations 23, 24, 41 on the cruise of the "Michael Sars" in 1910, at which *Bathygadus longifilis* was taken. At St. 24, the calculated bottom-temperature at 1615 metres' depth was 6°6, at St. 23 at 1215 metres 9°8.

## The horizontal or geographical distribution of fishes from the abyssal plain and intermediate zone.

**2600—5000 metres.**

| Species | Localities where captured | |
|---|---|---|
| | By the "Michael Sars" 1902: in Faroe-Shetland channel 1910: Stations 10, 35, 48, 53, 88 | By other expeditions (for the greatest part after Brauer) |
| *Harriotta raleighana* | 35, 101 | Off the east coast of North America. |
| *Bathytroctes alvifrons* p | 53 | Gulf of Panama, Galapagos Islands. |
| *(Bathytroctes rostratus)* p | (29, 56, 48) | (Bay of Biscay, Morocco, Pernambuco, Bay of Bengal, Diego Garcia, between Seychelles and Zansibar, off the north-east coast of Africa). |
| *Platytroctes apus* p | 35, | Atlantic Ocean, off Portugal (Zugmayer No. 92, pp. 8, 158), Canary Islands (Roule No. 79 b, pag. 12), Cape Verde Islands, Arabian Sea. |
| *Histiobranchus bathybius* | 53, 88, 92 | Pacific Ocean, Japan, between Africa and Kerguelen, Bering Sea. |
| *Ilyophis brunneus* | 53 | Galapagos. |
| *Bathysaurus ferox* p | 25, 35, 53, 88, 95 | New Zealand, off the east coast of North America, Morocco. |
| „ *mollis* p | 53 | Japan, South Pacific, Cape Verde Islands. |
| *Bathypterois longipes* p | 53 | Off the east coast of South America. |
| *Benthosaurus grallator* p | 53 | Gulf of Mexico, off the east coast of North America. |
| *Stephanoberyx gillii* p | 35, 53 | Off the east coast of North America. |
| *Halosauropsis macrochir* | 25, 35, 53, 88, 95 | Off the east coast of North America, Gibraltar, Morocco, the Azores, between South Africa and Kerguelen. |
| | Faroe-Shetland channel | |
| *Macrurus güntheri* | 25, 35, 95, 101 | Off the Hebrides, Morocco, the Azores. |
| *Macrurus (Chalinura) brevibarbis* | 10, 88, 101 | Off the east coast of North America. |
| „ „ *simulus* | 53, 88 | Off the east coast of North America, Denmark Strait. |
| „ *carapinus* | 35, 53, 88 | Off the east coast of North America. |
| „ *(Nematonurus) armatus* | 10, 35, 53, 88 | Between the Azores and Bay of Biscay, Pacific Ocean, New Zealand. |
| *Neobythites crassus* | 25, 88, 95 | Between the Azores and Bay of Biscay. |
| *Mixonus laticeps* | 53 | Atlantic Ocean, Cape Verde Islands. |
| *Dicrolene intronigra* | 48 | Caribbean Sea, Gulf of Mexico, off the east coast of North America, off Sudan Bank of Arguin, Andaman Sea, Arabian Sea, Bay of Bengal, off the north-east coast of Africa. |
| *Holcomycteronus digittatus* | 35 | Californian Gulf, off the west coast of Central America. |
| *Acanthonus armatus* | 35 | Philippines, off the north coast of New Guinea. |

## The horizontal or geographical distribution of fishes from the continental slope

**between 800 and 2600 metres.**

| Species | Localities where captured | |
|---|---|---|
| | By the "Michael Sars" 1902: Faroe Bank and Faroe-Shetland channel 1910: Stations 4, 23, 24, 25, 41, 70, 88, 95, 101 | By other expeditions |
| *Pristiurus murinus* | Faroe-Shetland channel | Irish Atlantic slope (Holt & Byrne No. 48, pag. 51). |
| *Centrophorus squamosus* | South-west of Faroe Islands | Portugal, off the north coast of Spain, Ireland, Iceland. |
| „ *calceus* | do. do. | Off the north coast of Spain, Portugal, Bank of Arguin, off the north-west coast of Africa, Madeira. |
| „ *coelolepis* | do. do. | Off Portugal (Vaillant No. 86, pag. 72). |

| Species | Localities where captured | |
|---|---|---|
| | By the "Michael Sars" 1902: Faroe Bank and Faroe-Shetland channel 1910: Stations 4, 23, 24, 25, 41, 70, 88, 95, 101 | By other expeditions |
| *Spinax princeps* | Faroe-Shetland channel<br>Faroe Bank<br>St. 25 | |
| *Centroscyllium fabricii* | Faroe-Shetland channel<br>Faroe Bank | Greenland, off the north-east coast of North America, Bank of Arguin. |
| *Raia fyllæ* | St. 25, 95 | Davis Strait, Denmark Strait, Norwegian Sea. |
| „ *vomer* | Faroe Bank | Iceland, Rockall, British Isles, off the coast of France, Mediterranean Sea, Madeira (Holt & Calderwood No. 46 b, pag. 386). |
| „ *nidrosiensis* | St. 4 | Norwegian fjords. |
| *Chimæra mirabilis* | Faroe-Shetland channel<br>St. 4 | North Atlantic slope from the Shetland Isles to the south-west of Ireland. (Holt & Byrne No. 49, pag. 17). |
| *Harriotta raleighana* | 35, 101 | Off the east coast of North America. |
| *Alepocephalus rostratus* p | St. 4, 23, 24, 41 | Mediterranean Sea, off Morocco and Sudan, Bank of Arguin, Cape Verde Islands, Canary Islands, the Azores. |
| „ *giardi* p | Faroe-Shetland channel<br>Faroe Bank<br>St. 4, 23, 24, 41 | Bay of Biscay. |
| „ *agassizii* p | 95, 101 | Off the east coast of North America, south-west of Iceland (Lütken No. 66, p. 8). |
| „ *productus* p | 25 | —„— —„— —„— |
| „ *macropterus* p | 24, 25, 41, 95 | Morocco, Sudan, Canary Islands, Caribbean Sea. |
| *Narcetes pluriserialis* p | 25, 95 | West to the Gulf of Panama. |
| *Talismania mollis* p | 24, 25 | Bay of Biscay. |
| *Synaphobranchus pinnatus* p (after Hjort & Murray) | Faroe Bank, Faroe-Shetland channel 4, 23, 24, 41, 95, 101 | Morocco, Sudan, the Azores, Canary Islands, Cape Verde Islands. East coast of North America, off Brazil, Arabian Sea, Phillipines, Japan. |
| *Bathysaurus ferox* p | 25, 35, 53, 88, 95 | New Zealand, off the east coast of North America, Morocco. |
| *Bathypterois dubius* p | 23, 41 | Off the east coast of North America, Bay of Biscay, Morocco, Sudan, the Azores, Canary Islands. |
| *Halosauropsis macrochir* | 25, 35, 53, 88, 95 | Off the east coast of North America, Gibraltar, Morocco, the Azores, between South Africa and Kerguelen. |
| *Halosaurus johnsonianus* | 23 | Morocco, Sudan, the Azores, Canary Islands. |
| *Notacanthus bonapartii* | Faroe-Shetland channel<br>Faroe Bank | Mediteranean Sea, Sudan, Bank of Arguin. |
| *Macdonaldia rostrata* | St. 4, 95 | Off the east coast of North America, Newfoundland. |
| *Trachyrhynchus trachyrhynchus* | 4, 23 | The trawling ground off the Tearaght, County Kerry (Holt & Byrne No. 47, pag. 24), Mediterranean Sea (Vinciguerra No. 88, pag. 619), Morocco, Sudan, Bank of Arguin, Cape Verde Islands (Vaillant No. 86, pag. 253). |
| „ *murrayi* | Faroe-Shetland channel<br>Faroe Bank | Faroe-Shetland channel. South-west of Iceland (Lütken No. 66, pag. 28). |
| *Macrurus (Coelorhynchus) talismani* | Faroe-Shetland channel<br>St. 4, 24, 41 | North-west of Hebrides, Sudan, Bank of Arguin, Bay of Biscay. |
| „ *sclerorhynchus* | 25 | The Azores, Cape Verde Islands. |
| „ *æqualis* | 4, 23, 41 | Cape St Vincent, Morocco, Sudan, the Azores, Canary Islands, Cape Verde Islands. |
| „ *zaniophorus* | Faroe Bank<br>St. 41 | Bay of Biscay, off the south coast of Portugal, Morocco, Sudan, the Azores, Cape Verde Islands.<br>Morocco, Sudan, Bank of Arguin. |
| *Macrurus güntheri* | Faroe-Shetland channel<br>25, 35, 95, 101 | Off the Hebrides, Morocco, the Azores. |
| „ *(Coryphænoides) rupestris* | Faroe-Shetland channel<br>Faroe Bank<br>St. 4, 70 | The Skagerrack, Faroe-Shetland channel, north-west of the Hebrides.<br>Bay of Biscay, Davis Strait, Denmark Strait, south of Iceland.<br>Newfoundland, off the east coast of North America. |
| „ *asperrimus* | 41 | Morocco, the Azores. |
| *Macrurus (Chalinura) murrayi* | 25, 95, 101 | New Zealand. |
| „ „ *brevibarbis* | 10, 88, 101 | Off the east coast of North America. |

| Species | Localities where captured | |
|---|---|---|
| | By the "Michael Sars" 1902: Faroe Bank and Faroe-Shetland channel 1910: Stations 4, 23, 24, 25, 41, 70, 88, 95, 101 | By other expeditions |
| *Bathygadus melanobranchus* | 23, 41 | Morocco, Sudan, Canary Islands, the Azores, Bay of Manar, Bay of Bengal, Andaman Sea, off the north-west coast of Sumatra, off the east coast of Africa. |
| *Bathygadus* sp. *(favosus?)* | 24 | Martinique, Gulf of Mexico, Caribbean Sea. |
| „ *arcuatus* | 23, 41 | Martinique, Gulf of Mexico. |
| „ *longifilis* | 23, 24, 41 | Morocco, Sudan, the Azores, Gulf of Mexico, Phillipines, west coast of Sumatra, Bay of Bengal, Arabian Sea, off the east coast of Africa. |
| *Antimora rostrata* | 25, 95, 101 Faroe-Shetland channel | Newfoundland, off the east coast of North America, Montevideo, Marion Islands. |
| *Halargyreus affinis* | Faroe Bank | Irish Atlantic slope (Holt & Byrne No. 48, pag. 58). |
| *Phycis blennioides* | 1, 3, 4, 21 | Tearaght trawling ground, County Kerry (Holt & Byrne No. 47, pag. 24), English Channel, Mediterranean Sea (Moreau No. 67), Portugal. |
| *Mora mora* | Faroe Bank 4, 23, 41 | Mediterranean Sea, Madeira, off the west coast of Ireland (Holt & Calderwood No. 46 b, pag. 437. Holt & Byrne No. 47, pag. 24). |
| *Lepidion eques* | Faroe-Shetland channel Faroe Bank 4, 101 | Faroe-Shetland channel, off the west coast of Ireland (Holt & Calderwood No. 46 b, pag. 448), Bay of Biscay (Koehler No. 57, pag. 487), Denmark Strait (Lütken No. 66, pag. 29). |
| *Hoplostethus mediterraneum* p | 4, 21 | Mediterranean Sea, Morocco, Sudan, Canary Islands, Cape Verde Islands, Madeira, the Azores, off the east coast of North America, Japan, East Africa, Arabian Sea, Bay of Bengal. |
| *Epigonus telescopus* | Faroe Bank | Mediterranean Sea, Morocco, Sudan, Canary Islands, Cape Verde Islands. |
| *Scorpæna cristulata* | 4 | Off Ireland (Holt & Byrne No. 48, pag. 25), Bay of Biscay (Koehler No. 57, pag. 478), off the coast of Florida. |
| *Cottunculus thomsonii* | North-west of the Hebrides 41 | Faroe-Shetland channel, off Sudan, Bank of Arguin, off the east coast of North America. |
| *Neobythites crassus* | 25, 88, 95 | Between the Azores and Bay of Biscay. |
| *Lycodes terræ novæ* | 70 | Newfoundland. |
| *Lycodonus mirabilis* | 70 | Off the east coast of North America. |
| *Monomitopus torvus* | 41 | Gulf of Panama. |
| *Dibranchus atlanticus* | 70 | Cape Verde Islands, off the west coast of Africa, off the east coast of North America, Gulf of Mexico, Barbados. |

On both sides of the North Atlantic there are forms which are also found living on the slopes in the north, in Denmark Strait and Davis Strait, thus making connection between east and west. The temperatures in their area of distribution vary between abt. 3° and abt. 8°. Such forms are *Centroscyllium fabricii, Raia fyllæ* and *Macrurus rupestris.*

Other forms make connection across the range, being found not only on the continental slopes in east and west, but also either in the abyssals, or on the slight rise of the sea-floor which runs midway through the North Atlantic from north to south. Examples of this group are *Halosauropsis macrochir, Macrurus brevibarbis, M. carapinus* and *Dicrolene intronigra.*

Others again, are only found on the slopes, as for instance *Bathygadus arcuatus* and *longifilis;* the temperature limits for their occurrence down towards the deep water lie somewhat higher, at abt. 5°, while they can go up to a bottom-temperature of 10°.

If all that is now recorded under *Dibranchus atlanticus* be one species, then it is certainly very adaptable both as regards occurrence at different depths and also at different temperatures, being noted from Barbados at abt. 125 metres' depth, where Schott's chart gives abt. 20°, and off the Newfoundland Bank at 1100 metres' depth, where the temperature is 3°.5, besides intermediate depths east of North America and west of Africa, with temperatures between 4° and 11°.5.

It is to be hoped that future investigations may further elucidate these questions.

Finally, a table with some few observations as to species living both on the western and on the eastern side of the Atlantic.

## Fishes found on both sides of the Atlantic.

| Species | Localities on the American side | Depth in metres | Temp.[1]) | Localities on the European side | Depth in metres | Temp. |
|---|---|---|---|---|---|---|
| *Centroscyllium fabricii* | Greenland, north-east coast of America | | | Faroe Bank, Faroe-Shetland channel | 831, 1073 | 8°07 |
| | | | | Bank of Arguin | 1495 | 4°5 |
| *Raia fyllæ* | Davis Strait | 150—1064 | 3°3 | Magerø, Denmark Strait | 280, 800 | |
| | | | | "M. S." St. 25, 95 | 2055, 1797 | 3°, abt. 7° |
| *Harriotta raleighana* | East coast of North America 36°—40° N. 70°—74° W. | 1293—1976 | (2°4—3°3) | „ St. 35, 101 | 2603, 1853 | abt. 4°, 3°2 |
| *Alepocephalus agassizii* p | East coast of North America | 983—2022 | | South-west of Iceland (Lütken, No. 68, p. 8) | 1715 | 3°5 |
| | | | | "M. S." St. 95, 101 | 1797, 1853 | abt. 7°, 3°2 |
| „ *productus* p | —„— —„— | 2492 | | „ St. 25 | 2055 | 3° |
| „ *macropterus* p | Caribbean Sea | 124 | 20° | Off the coast of Morocco, Sudan, Canary Isl. | 865—2115 | 7°, 5° |
| | | | | "M. S." St. 24, 25, 41, 95 | 1365—2055 | 6°6—3° |
| *Synaphobranchus pinnatus* p (after Hjort & Murray) | Off Brasil | 2193 | | Off the coast of Morocco, Sudan, the Azores, Canary Islands, Cape Verde Islands | 405—3200 | |
| | East coast of North America | 195—2652 | | Faroe Bank, Faroe Shetland channel | 750—1073 | 8°07 |
| | | | | "M. S." St. 4, 23, 24, 41, 95, 101 | 923—1853 | 9°8—3°2 |
| *Bathysaurus ferox* p | Off the east coast of North America | 1798—3032 | | Morocco | 2200 | |
| | | | | "M. S." St. 25, 35, 53, 88, 95 | 1797—3120 | abt 7°, 2°5 |
| *Bathypterois longipes* p | —„— - South America | 4844 | ÷ 0°4 | „ St. 53 | 2615—2865 | abt. 2°5 |
| *Benthosaurus grallator* p | Gulf of Mexico | 3382 | | „ St. 53 | 2615—2865 | abt. 2°5 |
| | East coast of North America | 2809 | | | | |
| *Stephanoberyx gillii* p | —„— —„— | 2248—5393 | | „ St. 35, 53 | 2603—2865 | abt. 4°—2°5 |
| *Halosauropsis macrochir* | —„— —„— | 1183—2622 | (3°—6°) | Gibraltar, Morocco, the Azores | 1993—2995 | 2°6—4° |
| | 35°—41° N. 65°—76° W. | | | the Azores | 1372 | |
| | | | | "M. S." St. 25, 35, 53, 88, 95 | 1797—3120 | 2°5—7° |
| *Macdonaldia rostrata* | East coast of North America 39° 47′ N. 70° 30′ W. | | | „ St. 4, 95 | 923—1797 | 8°5, abt. 7° |
| | Newfoundland | 1267 | | Denmark Strait | 846—1068 | 4°4—5°5 |
| *Macrurus (Coryphænoides) rupestris* | Davis Strait | 739—1094 | 3°3—3°8 | South of Iceland | 912—1715 | 3°5, 6°1 |
| | | | | The Skagerrack | 300—550 | |
| | Newfoundland | 155 | | North-west of Hebrides, Faroe-Shetland channel, Bay of Biscay | 1410 | |
| | East coast of North America 37°—43° N. | 860—1653 | (3°—6°) | | | |
| | "M. S." St. 70 | 1100 | 3°5 | Faroe Bank, Faroe-Shetland channel | 831—1073 | 8°07 |
| | | | | "M. S." St. 4 | 923 | 8°5 |
| *Macrurus (Chalinura) simulus* | East coast of North America 32°—41°30′ N. | 605—2250 | (4°2 ?—3°7) | Denmark Strait | 1670—2250 | 3°5—3°1 |
| | | | | "M. S." St. 53, 88 | 2615—3120 | 2°5 |
| „ „ *brevibarbis* | —„— —„— 39°—41° N. | 1820—3100 | (3°8—2°7) | „ St. 10, 88, 101 | 4700—1853 | 2°5—3°2 |
| „ „ *carapinus* | —„— —„— 35°—42° N. | 1200—2640 | (3°2—2°4) | „ St. 35, 53, 88 | 2603—3120 | abt. 4°—2°5 |
| *Bathygadus favosus* | Martinique, Gulf of Mexico Caribbean Sea | 768—2744 | (7°—4°) | „ St. 24 | 1615 | 6°6 |
| „ *arcuatus* | Martiniqe, Gulf of Mexico | 610—870 | (7°5—10°) | „ St. 23, 41 | 1215, 1365 | 9°8, abt. 6°7 |
| „ *longifilis* | Gulf of Mexico | 959—1353 | (4°7—6°) | Morocco, Sudan | 1084—1635 | 8°8—6°5 |
| | | | | The Azores | 1287 | |
| | | | | "M. S." St. 23, 24, 41 | 1215—1615 | 9°8, 6°6 |

| Species | Localities on the American side | Depth in metres | Temp.[1]) | Localities on the European side | Depth in metres | Temp. |
|---|---|---|---|---|---|---|
| *Antimora rostrata* ..... | Montevideo | 1097 | 2°7 | 43°45′ N., 9°41′ W. (Zugmayer, No. 92) | 2320 | |
| | East coast of North America 33°—42° N., 65°—76° W. | 559—2621 | 5°? | "M. S." St. 25, 95, 101 | 2055—1797 | 3°, abt. 7° |
| | (306 faths. 41° 34′ N., 65° 54′ W.; 1434 faths. 39° 15′ N., 71° 25′ W.; G. & B. No. 37) | | 2°8 | | | |
| | Newfoundland | 1267 | | | | |
| *Hoplostethus mediterraneum* p ... | East coast of North America 37°—40° N., 71°—74° W. | 286—591 | | Mediterranean Sea, the Azores, Madeira, Canary Islands | | |
| | | | | Morocco, Sudan, Cape Verde Islands | 140—1435 | |
| *Scorpæna cristulata* ..... | Coast of Florida 30° 44′ N. 79° 26′ W. | 804 | | "M. S." St. 4, 21 | 923—535 | 8°5—11°1 |
| | | | | Ireland, Bay of Biscay | 470—1504 | 8°35—9°19 |
| *Cottunculus thomsonii* ..... | East coast of North America 35°—42° N., 65°—73° W. | 191—1568 | (?—3°2) | "M. S." St. 4 | 923 | 8°5 |
| | | | | North-west of the Hebrides | 1073 | 8°07 |
| | | | | Faroe-Shetland channel | | |
| | | | | Sudan, Bank of Arguin | 1139—1495 | 7°—5°9 |
| *Dicrolene intronigra* ..... | Caribbean sea, Gulf of Mexico | 847—1796 | 7°—4°2 | "M. S." St. 41 | 1365 | abt. 6°7 |
| | East coast of North America 33°—41° N. | | | Sudan, Bank of Arguin | 888—1495 | 7°—4°5 |
| *Dibranchus atlanticus* ..... | Barbados | 135 | (20°) | "M. S." St. 48 | abt. 5000 | abt. 2°4 |
| | Gulf of Mexico | 298—955 | (4°?—10°?) | West coast of Africa, 10° 12′ N., 17° 25′ W. | 675 | (5°—6°) |
| | East coast of North America 34°—40° N. | | | | | |
| | 39° 53′ N., 70° 58′ W. (G. & B., No. 37) | 686 | (4°0) | Cape Verde Islands | 405 | 10°—11°5 |
| | "M. S." St. 70 | 1100 | 3°5 | Cape Verde Islands (Route No. 79 b, p. 26) | 875—1300 | |

[1]) The temperatures in parentheses are estimated from the plates in Schott's Oceanography from the "Valdivia" Expedition.

# Descriptions.

(Where nothing else is remarked the measurements in the tables are given in mm.).

# Class Cyclostomata.

## ORDER MYXINOIDES.

### *Myxinidæ.*

***Myxine glutinosa,*** Lin.

St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand. 7 eggs. One of them is damaged; the remainder showed the following measurements taken in preserved condition.

| Length without filaments and granulosa | Breadth |
|---|---|
| 15 mm. | 6,5 mm. |
| 16 „ | 5,7 „ |
| 16,5 „ | 6,5 „ |

| Length without filaments and granulosa | Breadth |
|---|---|
| 16,5 mm. | 6,5 mm. |
| 17 „ | 6,5 „ |
| 17 „ | 6,5 „ |

The eggs together with the filaments are still encased in the outermost glassy and translucent membrane and the filaments still enveloped in the granulosa.

References: No. 50 a, JENSEN, AD., S. 1900 pag. 1, pl. I. No. 20, DEAN, BASHFORD 1899 pag. 238, pl. XV. No. 21, DEAN, BASHFORD 1900, pag. 33, pl. II.

# Class Pisces.

## Subclass Elasmobranchii.

## ORDER PLAGIOSTOMI.

### SUBORDER SELACHII.

### *Scylliorhinidæ.*

***Scylliorhinus atlanticus,*** n. sp.
(Pl. III, fig. 3).

1 specimen, 25 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

This fish is related both to *S. profundorum,* (GOODE and BEAN, No. 37, pag. 17, fig. 16) and *S. indicus,* (BRAUER, No. 8, pag. 8—9, pl. XIV, fig. 1). From the former it differs in having a larger eye, partly also as regards the position of the fins; from *indicus* especially by the fact that the anus is situate in front of the middle of the fish.

*Scylliorhinus sibogæ* (WEBER, No. 90, pag. 595—596) also agrees in many points with the mentioned species. The size of the eye corresponds more nearly to that in *profundorum,* though the species differs from this, *inter alia* by the longer anal fin. In addition, it is light in colour; it was also taken at a lesser depth than the others.

On comparison, points of resemblance and of difference will be apparent. Some of the measurements for *Sc. profundorum* are from statements kindly furnished by Mr. B. A. BEAN.

The height of body goes here, as in the case of *sibogæ,* about 11 times into the total length; in *indicus* and *profundorum* only $7\,^3/_4$ and $7\,^3/_5$. As regards proportion between head and total length, the different species agree fairly well together, *indicus,* however, standing somewhat apart, with a longer head than the remainder; the length of head in *indicus* is to total length as 1 : 3.6; in the others as 1 : 4—$4^1/_2$.

The breadth of head and length of snout in proportion to length of head agree well enough; in length of eye, however, there is a notable difference. The *Scylliorhinus* from the "Michael Sars" has the proportionately largest eye — the entire orbita as defined by skin is measured — *profundorum* the smallest. The "M. S." fish is in this

respect nearest *indicus, profundorum* nearest *sibogæ,* the proportion between eye and head in *atlanticus* is 1 : 4.83, in *indicus* 1 : 5.6, in *sibogæ* 1 : 6.89 and in *profundorum* 1 : 7.9. In the proportion between snout and eye therefore, *atlanticus* and *indicus* also are most alike, the eye being to the snout in *atlanticus* as 1 : 2.14 and in *indicus* as 1 : 2.5; in *sibogæ* 1 : 3.3, and *profundorum* as 1 : 3.56.

The distance between nasal cavities and distance from nasal cavity to upper jaw show very much the same proportion in all.

Thus in *profundorum,* we have:

Distance between nasal cavities (22.5 mm.) equal to half the interorbital space (45 mm.),

and the distance between nasal cavity and upper jaw equal to half that between nasal cavities.

In *indicus:*

Distance between nasal cavities (16.5 mm.) equal to the length of the eye (16 mm.) and about half the interorbital space (30 mm.),

and the distance from nasal cavity to upper jaw (8.2 mm.) equal to half the length of the eye.

In *atlanticus:*

Distance between nasal cavities 10 mm.

Interorbital space 17 mm.

Distance from nasal cavity to upper jaw 5.2 mm.

Length of the eye 12 mm.

WEBER remarks on *sibogæ* (No. 90, pag. 595).

"Die Entfernung zwischen den beiden hinteren Nasenlöchern ist erheblich länger als die Augenbreite, die kürzeste Entfernung zwischen dem hinteren Nasenrande und dem Oberkiefer ist gleich Dreiviertel der Augenbreite."

But he gives himself the following measurements:

Distance between nasal cavities 9 mm.

Length of the eye 8 mm.

Distance from nasal cavity to upper jaw 5 mm.

Interorbital space 13 mm.

Thus, as a matter of fact, giving a distance between the nasal cavities of abt. 2/3 the interorbital space.

The branchial slits are not so high in *atlanticus* as in *profundorum;* in this, GOODE and BEAN state them as being "somewhat less than the long diameter of the eye" and the figure shows the height of the gill opening as 2/3 of the eye, whereas the largest, to wit, the third of these apertures is in *atlanticus* only abt. half as high as the eye is long. As in *profundorum,* the 5 gill slits extend over a part half as long as the snout. The fifth gill aperture lies over the angle of the pectoral fin, as in *indicus,* whereas in *profundorum* and *sibogæ,* both the fourth and the fifth lie dorsally to the pectoral fin. The length of this, (abt. 29 mm.) is somewhat less than the head minus the snout (abt. 32½ mm.) which apparently agrees with what BRAUER and WEBER state with regard to *indicus* and *sibogæ;* "fast gleich der Kopflänge ohne die Schnauze."

The ventral fins are, in *sibogæ* and *atlanticus,* quite in front of the middle of the body, whereas in *indicus* and *profundorum* they are only partially so. Their base is, in *indicus,* as long as the snout; in the others less. The specimen from the "Michael Sars" was a male, with short, finger-shaped *appendices genitales.*

In *profundorum* and *atlanticus,* the base of the second dorsal fin is as large as that of the first; in *indicus* and *sibogæ,* that of the first is larger. The first dorsal fin commences, in *indicus,* above the anus, behind the middle of the fish; in *profundorum,* apparently above the anus, just at the middle; in *sibogæ* and *atlanticus* behind the anus, in front of the middle of the fish.

In *sibogæ,* the origin of the anal fin is below the commencement of the base of the first dorsal fin, close behind the ventral fins; in *indicus* and *atlanticus,* below the posterior hindermost point in the base of the first dorsal fin; in *indicus* it lies close behind the ventral fin, but in *atlanticus* a little distance away; finally, in *profundorum,* the anal fin commences behind the termination of the base of the first dorsal; *i. e.* below the point of the fin. In all the anal fin terminates below the rearmost point in the base of the second dorsal fin.

In *profundorum,* the length of the anal fin is somewhat less than, in *atlanticus* and *indicus* about equal to, the combined length of snout and eye; in *sibogæ,* it is equal to the distance from tip of snout to first branchial aperture. The length of the anal fin in *sibogæ* goes 5¾ times into the total length, in *indicus* 6 times or a little less, in *atlanticus* 7 times, and in *profundorum* 8 times into the same. Thus the anal fin is longest in *Scyliorhinus sibogæ,* albeit not much longer than in *indicus.*

The colour is, in *indicus, profundorum* and *atlanticus,* brown; WEBER gives the colour of *sibogæ* as "schwach rötlich weiss."

*Atlanticus* resembles *indicus* and *profundorum,* but cannot, from what we have seen, be identified with either. REGAN (No. 71, pag. 455), in his synopsis, gives the following character for *Sc. indicus:* "Anal 2¾ as long as second dorsal, which is larger than the first" and for *profundorum:* "Anal twice as long as second dorsal, which is as large as the first". Now in *atlanticus,* the first and second dorsal fins are equally large, whereas the anal fin is 2⅗ times as long as the second dorsal. In addition, the value for proportion between length of anal fin and total length lies midway between the corresponding values for *indicus* and *profundorum.* In these respects therefore, *atlanticus* represents an intermediate stage between *indicus* and *profundorum.*

| Total length | Height of body | Length of head | Width of head behind spiracle | Length of snout | Distance from tip of snout to upper jaw | Width of mouth | Horiz. diam. of eye | Interorbital space | Distance between nasal cavities | Nasal cavity to upper jaw | Height of third branch. slit | Distance 1st to 5th branch. slit | Length of pectoral fin | Snout to ventral fin | Ventral fin basis without app. gen. | Snout to first dorsal fin | Snout to anus | Basis of first dorsal | Basis of second dorsal | Dist. between first and second dorsal | Basis of anal fin | Snout to anal fin | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | | | | | | |
| 228 | 20 | 55 | 31 | 27 | — | — | 8 | 13 | 9 | 5 | — | — | — | — | 21 | — | 102 | — | — | — | 40 | — | *sibogæ*, Weber. |
| 247 | 22 | 58 | 31 | 25.6 | 22 | 22 | 12 | 17 | 10 | 5.2 | 5.5 | 13 | abt. 29 | 96 | 17.5 | 118 | 109 | 13.5 | 13.5 | 22 | 35.5 | 127 | *atlanticus*, "M. S.", St. 41. |
| 326 | 42 | 90 | 53 | 40 | — | 33.5 | 16 | 30 | 16.5 | 8.25 | — | — | — | 145.5 | 37 | 177 | — | 13 | 20 | — | 55 | 185 | *indicus*, Brauer. |
| *) 520 | 69 | 126 | — | 57 | 45 | 44 | 16 | 45 | 22.5 | 11.25 | 10.5 | 24 | — | 228 | 45 | 261 | — | 33 | 33 | 45 | 64.5 | 304.5 | *profundorum*, Goode & Bean. |

*) The distances tip of snout to eye, tip of snout to mouth, the width of mouth, horizontal diameter of eye, interorbital space, distance between nasal cavities are kindly measured on the type specimen by Mr. B. A. BEAN. The other measurements are taken on the figure and multiplied with 3.

| Total length | Total length: Height of body | Total length: Length of head | Length of head: Width of head | Length of head: Length of snout | Snout to upper jaw: Width of mouth | Length of head: Horizont. diam. of eye | Length of snout: Horizont. diam. of eye | Interorb. space: Horizont. diam. of eye | Interorb. space: Distance between nasal cavities | Distance between nasal cavities: Horizont. diam. of eye | Horizont. diam. of eye: Nasal cavity to upper jaw | Length of snout: Ventral fin basis | Anal fin basis: Second dorsal fin basis | Total length: Anal fin basis | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | |
| 228 | 11.4 | 4.1 | 1.7 | 2.04 | — | 6.89 | 3.3 | 1.6 | 1.45 | 1.12 | 1.60 | 1.29 | — | 5.70 | *sibogæ*, Weber. |
| 247 | 11.22 | 4.26 | 1.87 | 2.26 | 1.0 | 4.83 | 2.14 | 1.42 | 1.70 | 0.83 | 2.31 | 1.46 | 2.63 | 6.96 | *atlanticus*, "M. S.", St. 41. |
| 326 | 7.7 | 3.6 | 1.7 | 2.2 | — | 5.6 | 2.5 | 1.9 | 1.82 | 1.03 | 1.94 | 1.08 | 2.75 | 5.93 | *indicus*, Brauer. |
| 520 | 7.54 | 4.12 | — | 2.21 | 1.02 | 7.88 | 3.56 | 2.81 | 2.00 | 1.41 | 1.42 | 1.27 | 1.95 | 8.06 | *profundorum*, Goode & Bean. |

***Scylliorhinus caniculus,*** Lin.

5 specimens, 40—63 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′; 184 m., fine sand.

1 specimen, St. 14, 22/4, N. 41° 15′, W. 8° 54′; 69 m.

6 specimens, St. 20, 5/5, N. 35° 25′, W. 6° 25′; 141 m., fine sand.

1 specimen, 34 cm., St. 39 B, 21/5, N. 26° 3′, W. 15° 0′; 267—280 m., fine grey sand.

***Pristiurus melanostomus,*** Bonap.

1 specimen, St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

11 specimens, St. 21, 5/5, N. 35° 31′, W. 6° 35′; 535 m., yellow sand.

## *Carchariidæ.*

***Mustelus vulgaris,*** Müll. and Henle.

1 specimen in Portuguese fishing-boat, St. 13, 22/4, N. 41° 32′, W. 9° 05′; 78 m.

## *Lamnidæ.*

***Carcharodon sp.***

One fossil tooth, St. 48, 31/5, N. 28° 54′, W. 24° 14′. More than 5000 m.

***Oxyrhina sp.***

One fossil tooth, St. 48, 31/5, N. 28° 54′, W. 24° 14′. Over 5000 m.

## *Squalidæ.*

***Oxynotus centrina,*** Rafin.

Embryos shed on deck of a specimen from a Portuguese fishing-boat. St. 13, 22/4, N. 41° 32′, W. 9° 05′, 78 m.

***Squalus acanthias,*** Lin.

20 specimens, St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

8 specimens, St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

4 specimens, St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

5 specimens, one measured 22 cm., St. 39 B., 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

***Spinax princeps,*** Collett.

(Pl. III, fig. 4).

1904 *Etmopterus princeps,* Collett. (No. 14 a, pag. 3).
1905 (1909) „ „ „ (No. 14 b, pag. 29, pl. I, figs. 1—2).
1908 *Spinax princeps,* Regan. (No. 72, pag. 43—44).

1 specimen, 41 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m.; yellow mud.

In tail and tail fin, the dermal denticles may be followed in longitudinal rows, albeit but indistinctly, the number of rows will then, however, be twice as great as noted by COLLETT (No. 14 b, pag. 29) for young specimens. The dermal denticles cover the fins, and the upper margin of the caudal is therefore rough. Their appearance is as shown by COLLETT; the base has 3 or 4 radiating points in the skin, and a short, recurvate spine projects from it.

The length of head goes about 4 times into total length — COLLETT gives $4^1/_2$ times — and the distance from tip of snout to mouth $9^1/_2$ times into the same; according to COLLETT, $11^1/_3$. The breadth of head is greater than the distance from tip of snout to mouth. Anterior branchial aperture probably the largest, but not twice as great as the spiracle.

Colour a brownish black with a bluish tinge on the fins.

Total length 413 mm.

Length of head 104.5 mm.; proportion to total length 3.96.

Tip of snout to mouth 43.5 mm.; proportion to total length 9.5.

Breadth of head abt. 53 mm.

1st branchial slit 9 mm.

5th branchial slit 7 mm.

Spiracle 7 mm.

***Spinax niger,*** Bonap.

2 specimens, St. 21, 5/5, N. 35° 31′, W. 6° 35′,535 m., yellow sand.

One of them shed youngs on deck.

The female preserved measures 33 cm.

## *Rhinidæ.*

***Rhina squatina,*** Duméril.

2 specimens, 108 and 119 cm., St. 39 B, 21/5, N. 26° 3′, W. 15° 0′; 267—280 m., fine grey sand.

***Raia clavata,*** Lin. *(Vide* also pag. 24).

(The measurements of the distance between the snout and the paired organs are taken along the

| Total length | Breadth of the disc | Tip of snout to foremargin of cloaca | Tip of snout to hindmargin of cloaca | Hindmargin of cloaca to tip of tail | Origin of ventral fin to tip of tail | Tip of snout to hindmargin of pectoral fin | Tip of snout to hindmargin of ventral fin | Tip of snout to lateral angle of pectoral fin | Lateral angle of pectoral fin to hindmargin of pectoral fin | Tip of snout to foremargin of nasal cavity | Distance between the outermost wall of nasal cavities | Width of nasal valve | Tip of snout to hindmargin of upper jaw | Width of mouth | Tip of snout to foremargin of eye | Length of the eye | Width of interorbital space |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | |
| 147 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 155 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 163 | 105 | 63.5 | — | — | — | 70 | 82 | — | — | 16 | — | 12 | — | 11 | 20 | 7 | 7 |
| 200 | 138 | 85 | 88.7 | 111.5 | 101.5 | 99 | 111.7 | — | — | 21 | 22 | 16.5 | 28.8 | 15 | 27 | 7.5 | 8.1 |
| 320 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 323 | 211 | 136 | 144 | 179 | 163 | 154 | 175 | 139.5 | 93.5 | 28.5 | 34 | 25 | 40.7 | 24 | 38 | 11.2 | 13 |
| 430 | 288 | 187 | 198 | 230 | 230 | 215 | 245 | 190 | 125 | 43 | 49 | 36 | 60 | 36 | 54 | 17 | 17 |

| Total length | Breadth of disc in percentage of total length | Tip of snout to foremargin of cloaca in percentage of breadth of disc | Tip of snout to hindmargin of cloaca in percentage of breadth of disc | Tip of snout to hindmargin of pectoral fin in percentage of breadth of disc | Tip of snout to hindmargin of ventral fin in percentage of breadth of disc | Tip of snout to foremargin of nasal cavity in percentage of total length | Tip of snout to foremargin of nasal cavity in percentage of breadth of disc | Basis of nasal valve in percentage of the distance between tip of snout and foremargin of cloaca | Tip of snout to foremargin of eye in percentage of total length | Tip of snout to foremargin of eye in percentage of breadth of disc | Width of interorbital space in percentage of distance between tip of snout and eye | Width of interorbital space in percentage of distance between tip of snout and nasal cavity | Locality |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | |
| 163 | 64.4 | 60.5 | — | 66.7 | 78.1 | 9.8 | 15.2 | 18.9 | 12.3 | 19.1 | 35 | 43.8 | St. 1 |
| 200 | 69 | 61.6 | 64.3 | 71.7 | 80.9 | 10.5 | 15,2 | 19.4 | 13.5 | 19.6 | 30 | — | St. 20 |
| 323 | 65.3 | 64.4 | 68.3 | 73 | 83 | 8.8 | 13.5 | 18.4 | 11.8 | 18 | 34.2 | — | St. 3 |
| 430 | 67 | 64.9 | 68.8 | 74.7 | 85.1 | 10 | 14.9 | 19.3 | 12.6 | 18.8 | 31.5 | — | St. 39 B |

median axis of the fish from the tip of snout to the line connecting the organs on either side).

| Diameter of spiracle | Series of teeth in upper jaw | Number of dorsal spines in median line before the dorsal fins | Spines between the dorsal fins | Spines on shoulder | Spines before eye | Spines behind eye | Coloration | Sex | Locality |
|---|---|---|---|---|---|---|---|---|---|
| — | — | — | 1 | — | — | — | | ♀ | St. 1 |
| — | — | — | 1 | — | — | — | | ♂ | St. 1 |
| — | — | 31 | 3 | 1 | 2 | 3 | Brownish grey with pale spots. | ♀ | St. 1 |
| — | — | 30 | 2 | 1 | 2 | 3 | Brown above with some pale dark-edged spots. The tail with undistinct crossbands. | ♂ | St. 20 |
| — | — | — | — | — | — | — | On each shoulder a dark stripe surrounded by pale spots. | ♂ | St. 3 |
| 8.7 | abt. 40 | 30 | 1 | 1 | 2 | 3 | The upper surface dark grey with pale black-edged spots, in the hinder part symmetrically arranged on each side of the median-line and forming crossbands on the tail; the under surface pale with dark edges. | ♂ | St. 3 |
| — | 50 | 28 [1]) | 1 | 1 | 2 | 1 | The upper surface grey, along the median line darker, nearly black; in this ground-colour large yellow spots with black margins, especially a series on each side of the median row of spines. | ♂ | St. 39 B |

[1]) Besides the large spines some small ones between them; making 48 in all.

| Total length | Total length: Breadth of disc | Total length: Distance between tip of snout and hindmargin of cloaca | Total length: Distance between hindmargin of cloaca and tip of tail | Total length: Distance between origin of ventral fin and tip of tail | Breadth of disc: Distance between tip of snout and hindmargin of pectoral fin | Distance between tip of snout and lateral angle of pectoral fin: Distance between lateral angle of pectoral fin and hindmargin of pectoral fin | Total length: Distance between tip of snout and nasal cavity | Distance between tip of snout and nasal cavity: Distance between outermost wall of nasal cavities | Distance between tip of snout and nasal cavity: Basis of nasal valve | Total length: Distance between tip of snout and upper jaw | Distance between tip of snout and upper jaw: Width of mouth | Total length: Distance between tip of snout and the eyes | Distance between tip of snout and the eyes: Interorbital space | Locality |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | |
| 163 | 1.55 | — | — | — | 2.33 | — | 10.2 | — | 1.33 | — | — | 8.15 | 2.86 | St. 1 |
| 200 | 1.45 | 2.25 | 1.79 | 1.97 | 1.39 | — | 9.5 | 0.96 | 1.27 | 6 95 | 1.92 | 7.41 | 3.34 | St. 20 |
| 323 | 1.53 | 2.24 | 1.80 | 1.98 | 1.37 | 1.49 | 11.3 | 0.84 | 1.14 | 7.94 | 1.70 | 8.50 | 4.37 | St. 3 |
| 430 | 1.49 | 2.17 | 1.87 | 1.87 | 1.34 | 1.52 | 10.0 | 0.88 | 1.19 | 7.17 | 1.67 | 7.96 | 3.18 | St. 39 B |

## SUBORDER BATOIDEI.

### *Raiidæ.*

***Raia clavata,*** Lin.

7 specimens, (3 measured 15—16 cm.); St. 1, 9/4, N. 49° 27′, W. 8° 36′; 146 m., fine sand.

25 specimens, small (2 measured 32 cm.), St. 3, 10/4, N. 49° 32′, W. 10° 49′; 184 m., fine sand.

Some specimens in Portuguese fishing-boat, St. 13, 22/4, N. 41° 32′, W. 9° 05′; 78 m.

5 specimens, (4 ♀, 1 ♂), St. 14, 22/4, N. 41° 15′, W. 8° 54′, 69 m.

1 specimen, 20 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

Some small specimens, (one measured 43 cm.), St. 39 B, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand. (For measurements *vide* tables pag. 22—23).

***Raia hyperborea,*** Collett.

1878. *Raja hyperborea*, Collett (No. 11, pag 9, pl. I, figs. 1 & 2).
1887. „ „ (Collett), Günther (No. 43, pag. 8, pl. IV).
1905 (1909). „ Collett (No. 14 b, pag. 10).
1914. *Raja* „ (Collett), Jensen (No. 52, pag. 20).

1 specimen, 18 cm., St. 102, 10/8, N. 60° 57′, W. 4° 38′, 1098 m., dark sand and clay. ♂

The measurements of the distance from the point of snout to the paired organs are taken along the median axis to a line connecting the organs.

Greatest breadth of disc 127 mm.; 70.6 % of total length.

Tip of snout to foremargin of cloaca 77 mm.

Tip of snout to hindmargin of cloaca 83 mm.; 52.6 % of total length.

Hindmargin of cloaca to tip of tail 95 mm.

Origin of ventral fin to tip of tail 89 mm.

Tip of snout to hindmargin of pectoral fin 84 mm.

Tip of snout to hindmargin of ventral fin 100 mm.

Tip of snout to lateral angle of pectoral fin 83 mm.

Lateral angle of pectoral fin to its hindmargin 53.2 mm.

Tip of snout to nostrils 15.5 mm., 12.2 % of greatest breadth.

Distance between the outermost wall of nostrils 23 mm.

Base of nasal valve 18 mm.

Tip of snout to hindmargin of upper jaw 23 mm.

Width of mouth 17.5 mm.

Tip of snout to foremargin of eyes 19 mm., 10.6 % of total length, 15 % of greatest breadth.

Tip of snout to centre of eyes 23 mm., 12.8 % of total length, 18.1 % of greatest breadth.

Breadth of disc at a line across centre of eyes 49 mm.

Length of eye 7 mm.

Interorbital space (flat) 10 mm.

The lobes of nasal valve show disposition to fringes.

The foremargin of the disc is undulated, the angle of pectoral fin below 90°, the ventrals rounded. A cutaneous flap extends along the ventral sides of the tail. The tail is pointed, its length behind second dorsal answers the combined bases of the two dorsals. No caudal fin. Nearly the entire upper surface with exception of the eyelids, the hindmargin of pectorals and the ventrals, is rough. A group of small spines on rostrum, 2 spines before the eye, 2 behind it, and of these 1 at the spiracle. 3 scapular spines. A group of 3 to 5 spines on the hind part of the pectoral origin. In the median line before the dorsals 30 spines without stellate base, 1 spine between the two dorsals, which are near one to the other.

The colour is grey with dark spots. The tail has pale and dark crossbands, which are also seen on the underside. The ventral side of the disc is yellow, but the underside of the pectorals fins, the hindmargin of the ventrals and the environs of the cloaca are violet grey. The specimen is a quite young male still with some trace of the origin of the yolk-sac.

***Raia punctata,*** Risso.

1810. *Raia punctata,* Risso (No. 76, pag. 12).
1832—41. *Dasybatis asterias,* Bonaparte (No. 5, pl. 66, fig. 2).
1841. *Raia schultzii,* Müller & Henle (No. 68, pag. 138, pl. 46, fig. 1).
1870. *Raia punctata,* (Risso), Günther (No. 41, vol. VIII, pag. 458).
1881. „ „ ( „ ), Moreau (No. 67, vol. I, pag. 426).
1906. „ „ Risso, forma *Schultzii,* Pietschmann (No. 70, pag. 124—125).

2 specimens (♂ and ♀), not preserved, St. 37, 20/5, N. 26° 6′, W. 14° 33′; 39 m., shingle.

2 specimens, 61—68 cm., forma *schultzii,* St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand, shingle.

4 specimens, 19—39 cm., forma *schultzii,* St. 39 B, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

The upper surface is rough on the smallest specimen; smooth on the others with exception of rostrum, the interorbital space, the eyelids and the foremargin of pectorals and with exception of the ordinary groups and series of spines. The male 61 cm. long has the spines characteristic for the male at the margin of the disc on the level of the eyes and inside the lateral angle of the pectorals. The ordinary groups of spines are arranged on the following manner:

1 to 3 spines before the eye, 1 or 2 behind it, 1 or 2 at the spiracle. On the shoulder the small ones have 1 spine, the two large specimens a group of small spines.

As to the spines in the median line of the disc and on the tail, it will be best to take each fish separately:

Total length 185 mm.: In the median line before first dorsal fin 29 spines; of these two large ones are situated before the scapular spines, one just behind them; after them follows on the disc before the posterior insertion of the pectorals 8, small but gradually increasing towards the tail. Between the two dorsals fins 1 spine. On both sides of the median series the upper surface of the tail is beset with small spines.

Total length 390 mm.: In the median line before the first dorsal fin 34 spines, 2 of them before the shoulder. Among the spines on the tail some small spines before the large ones or before cicatrix after a large one are probably intended to replacing the former. Not reckoning the small ones there are only 23 spines. Between the two dorsals 1 spine. Along the sides of the tail a series of smaller spines.

(The distances between the snout and the paired organs are taken from the tip of snout to the line connecting the organs).

| Total length | Greatest breadth | Tip of snout to hind-margin of cloaca | Hindmargin of cloaca to tip of tail | Origin of ventral fin to tip of tail | Tip of snout to hind-margin of pectoral fin | Tip of snout to lateral angle of pectoral fin | Lateral angle of pectoral fin to its hindmargin | Tip of snout to nostrils | Distance between outermost wall of nostrils | Base of nasal valve | Tip of snout to hind-margin of upper jaw | Width of mouth | Tip of snout to fore-margin of eyes | Tip of snout to centre of eyes | Length of eye | Interorbital space | Series of teeth in upper jaw | Sex | Locality |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | | |
| 185 | 119 | 78 | 103.2 | — | 84 | — | — | 17 | 18.7 | — | 24 | 13.2 | 21.5 | 25.5 | 7.7 | 7 | — | ♀ | St. 39 B. |
| 290 | 201 | 131.5 | 162 | — | 146 | 125 | 94 | 29 | 27.5 | — | 40.5 | 22.2 | 36.5 | 41.5 | 12.5 | 11 | abt. 50 | ♂ | St. 39 B. |
| 297 | 210 | 136 | 165 | 150 | 156 | 136 | 101 | 31 | 27 | 20 | 44 | 21.5 | 38 | 44 | 11.5 | 11 | abt. 50 | ♂ | St. 39 B. |
| 390 | 277 | 187 | 207 | 188 | 203 | 177 | 126 | 39 | 36 | 25 | 54 | 32 | 52 | 58 | 16 | 16 | 50 | ♂ | St. 39 B. |
| 605 | 410 | 274 | 318 | 297 | 304 | 275 | 190 | 50 | 55 | 40 | 69 | 51 | 69 | 80 | 24 | 24 | abt. 52 | ♂ | St. 38 |
| 680 | 457 | 352 | 342 | 295 | 354 | 315 | 235 | 68 | 65 | 46 | 94 | 52.5 | 89 | 103 | 29 | 29 | abt. 60 | ♀ | St. 38 |

| Total length | Total length: Greatest breadth | Total length: Tip of snout to hind-margin of cloaca | Total length: Hindmargin of cloaca to tip of tail | Total length: Origin of ventral fin to tip of tail | Greatest breadth: Tip of snout to hind-margin of pectoral fin | Tip of snout to lateral angle of pectoral: Lateral angle of pectoral to its hindmargin | Total length: Tip of snout to nostrils | Tip of snout to nostrils: Distance between outermost wall of nostrils | Total length: Tip of snout to hind-margin of upper jaw | Tip of snout to hind-margin of upper jaw: Width of mouth | Total length: Tip of snout to fore-margin of eyes | Total length: Tip of snout to centre of eyes | Tip of snout to fore-margin of eyes: Interorbital space | Tip of snout to centre of eyes: Interorbital space | Sex | Locality |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | |
| 185 | 1.55 | 2.37 | 1.79 | — | 1.42 | — | 10.9 | 0.91 | 7.71 | 1.82 | 8.6 | 7.25 | 3.07 | 3.65 | ♀ | St. 39 B. |
| 290 | 1.45 | 2.20 | 1.79 | — | 1.38 | 1.3 | 10.0 | 1.05 | 7.16 | 1.87 | 7.95 | 6.99 | 3.32 | 3.77 | ♂ | St. 39 B. |
| 297 | 1.41 | 2.18 | 1.80 | 1.98 | 1.35 | 1.35 | 9.6 | 1.15 | 6.75 | 2.05 | 7.82 | 6.75 | 3.45 | 4.00 | ♂ | St. 39 B. |
| 390 | 1.41 | 2.08 | 1.88 | 2.08 | 1.36 | 1.40 | 10.0 | 1.08 | 7.23 | 1.69 | 7.50 | 6.73 | 3.25 | 3.62 | ♂ | St. 39 B. |
| 605 | 1.48 | 2.20 | 1.90 | 2.04 | 1.35 | 1.45 | 12.1 | 0.91 | 8.77 | 1.35 | 8.76 | 7.56 | 2.73 | 3.33 | ♂ | St. 38 |
| 680 | 1.49 | 1.93 | 1.99 | 2.31 | 1.29 | 1.34 | 10.0 | 1.05 | 7.23 | 1.79 | 7.64 | 6.60 | 3.07 | 3.56 | ♀ | St. 38 |

Total length 605 mm.: Before the shoulder 4 spines; behind shoulder the disc shows traces of lost spines; behind the posterior insertion of pectorals 45 spines large and small alternately or in some places in alternate pairs. Between the two dorsal fins 1 spine not quite in the median line. On the left side of the tail 9 spines, on the right 7.

Total length 680 mm.: Before the shoulder 4 spines, after them follows a rough region; a little behind the centre of the disc the series of spines commences again with 20 spines on the disc; the last of them are not quite in the median line. On the tail the median series divides into three, with 27 small spines in the middle partly hidden in the skin and 18 large to the right, 15 to the left besides 3 hidden in the skin. The lateral series on the tail consists of 19 spines on the right side, 16 on the left; the foremost of these spines are situated nearly midway between the lateral flap and the median series, but at the dorsal fins the spines are only a little remote from the lateral flap.

The colour on the under surface is pale, on the upper surface brown or brownish grey with several dark brown spots; besides these the fish of 18.5 cm. has pale patches surrounded by brown spots.

The ray of 29 cm. has as a special design. The dark brown spots are only few on the hindmost portion of the disc. The principal are:

On each pectoral fin a little behind the middle 4 or 5 on pale ground surrounding a faint dark spot;

before the hindmost insertion of the pectorals two spots on pale ground, one before the other

and on the right side also two such spots before the group of five.

Otherwise pale dark-edged patches are scattered over the brownish grey ground colour.

### *Raia microocellata,* Montagu.

1906. *Raia microocellata,* (Montagu), Pietschmann (No. 70, pag. 90, pl. V).

2 specimens, 71—80 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′; 39 m., shingle.

Distance from tip of snout to nostrils over 70 % of the base of the nasal valve, and distance from tip of snout to centre of eyes less than half the breadth of the disc at centre of eyes. Distance between tip of snout and nostrils is in the male about equal to the distance between the outer margin of the nostrils, in the female slightly more; further, it is slightly more than 2/3 the distance of cleft of mouth from tip of snout.

Distance between outer margin of nostrils slightly more than breadth of mouth (1 : 0.89—0.99) and this is again slightly more than the base of the nasal valve (1 : 0.88—0.87). There are 50 rows of teeth in the upper jaw. Eyes about the same distance from tip of snout as the mouth. Between the eyes, the head is concave, and the interorbital distance is between 2 and 3 times the length of eye, and also greater than the eye and the spiracle immediately behind it combined. The tip of the snout projects slightly, most in the case of the female. The anterior margin of the disc is undulated, the greatest concavity being about on a level with the spiracle. A straight line from the tip of snout to the angle of the pectoral fin falls within the margin of the disc. The angle of the pectoral fin is a right angle. The anterior margin of the disc is about 1/3—1/4 longer than the posterior. Breadth of the disc abt. 2/3 total length; its length to posterior margin of pectoral fin slightly over half total length.

The hindmost point of the cloaca lies about as far from the tip of snout as from tip of tail. Along the sides of the tail runs a fold of skin, particularly developed behind the dorsals. These are separate, the second dorsal fin, however, being connected with the rudimentary caudal fin.

The upper side is rough, but there are no orbital or humeral spines. There is a median row of close-set spines but no spine between the two dorsal fins. In addition, there are large spines on the sides of the tail; in the male, only a few in front, whereas in the case of the female, they are close-set, with recurvate points, along the greater part of the sides of the tail, giving a serrate appearance. The male has claw-like spines on the forepart of the pectoral fins and on the side within their lateral angle.

Both male and female have the colour pattern characteristic of the species, with light stripes along the margin of the disc, and light spots.

### *Raia alba,* Lacép.

1832—41. *Raia marginata,* Bonaparte (No. 5).
1852—53. „ *lintea,* (non Fries), Kröyer (No. 58, vol. III, pt. 2, pag. 1005).
1881. „ *alba,* (Lacép.), Moreau (No. 67 I, pag. 412).
1880—84. „ „ „ Day (No. 19 II, pag. 339, pl. CLXVIII).
1906. „ „ „ Pietschmann (No. 70, pag. 128).

1 specimen, 139 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

Greatest breadth 1010 mm.; proportion to total length 1 : 1.38 or 72.7 % of total length.

Tip of snout to cloaca 740 mm.; proportion to total length 1 : 1.88 or 53.2 % of total length, proportion to greatest breadth 1 : 1.36 or 73.2 % of greatest breadth.

Cloaca to tip of tail 650 mm.; proportion to total length 1 : 2.14 or 46.7 % of total length.

Tip of snout to lateral angle of pectoral fin 710 mm.

Lateral angle of pectoral fin to its hindmargin 450 mm.; proportion to the distance from tip of snout to lateral angle of pectoral fin 1 : 1.58.

Tip of snout to nostrils 200 mm.; proportion to total

length 1 : 6.95 or 14.4 % of total length, proportion to greatest breadth 1 : 5.05 or 19.8 % of greatest breadth.

Tip of snout to upper jaw 250 mm.; proportion to total length 1 : 5.56 or 18 % of total length, proportion to breadth of disc across mouth 1 : 1.60 or 62.5 % of breadth of disc across mouth.

Breadth of disc across the mouth 400 mm.

Tip of snout to foremargin of eye 250 mm.; proportion to total length 1 : 5.56 or 18 % of total length, proportion to greatest breadth 1 : 4.04 or 24.8 % of greatest breadth.

Breadth of disc across centre of eyes 420 mm.

Tip of snout to line across centre of eyes 260 mm.; proportion to breadth of disc across centre of eyes 1 : 1.62.

Length of *appendix genitalis* from hindmargin of cloaca to its end 400 mm.

Length of *appendix genitalis* from the angle with the tail to its end 330 mm.

The jaws contain abt. 46 rows of teeth, the teeth of the median rows are pointed, those of the 7 outermost rows at least on either side being flat.

The back is smooth except in front of the shoulders, where the pointed snout especially is rough.

There are also the claw-shaped spines characteristic of the male, on the outer part of the pectoral fins in two rows, on the anterior part in several rows. In the middle of the tail there is a row of recurvate spines, as also along either side of the tail. There are two large almost semicircular dorsal fins, and between them, in a transverse row, three spines, of which the middle one is smaller than the two others. The caudal fin, on the other hand, appears merely as a carina.

Colour on the back grey, with white spots, and a faint black ocellus on either shoulder; belly white, save for the bluish nasal cartilage.

### ***Raia miraletus,*** Lin.

1870. *Raia miraletus,* (Lin.), Günther (No. 41, VIII, pag. 460).

Abt. 20 specimens, 12 of them measured 17—33 cm., St. 39 B, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

The measurements to the paired organs are taken along the axis of the body from tip of snout to line connecting the organs on either side.

A young male of total length 330 mm.

Greatest breadth 194 mm.; proportion to total length 1 : 1.70.

Tip of snout to hindmargin of cloaca 140 mm.; proportion to total length 1 : 2.36.

Hindmargin of cloaca to tip of tail 190 mm.; proportion to total length 1 : 1.74.

Origin of ventral fin to tip of tail 177 mm.; proportion to total length 1 : 1.86.

Tip of snout to hindmargin of pectoral fin 150 mm.; proportion to greatest breadth 1 : 1.29.

Tip of snout to lateral angle of pectoral fin 130 mm.

Lateral angle of pectoral fin to its hindmargin 87 mm.; proportion to distance from tip of snout to lateral angle of pectoral fin 1 : 1.49.

Tip of snout to nostrils 33 mm.; proportion to total length 1 : 10.0.

Distance between the outermost wall of nostrils 29.5 mm.; proportion to the distance between tip of snout and nostrils 1 : 1.12.

Base of nasal valve 23 mm.; proportion to the distance between tip of snout and nostrils 1 : 1.28.

Tip of snout to hindmargin of upper jaw 43 mm.; proportion to total length 1 : 7.67.

Width of mouth 24 mm.; proportion to distance from tip of snout to hindmargin of upper jaw 1 : 1.79.

Tip of snout to foremargin of eyes 39 mm.; proportion to total length 1 : 8.46.

Length of eye 14 mm.

Interorbital space 9 mm.; proportion to the distance between tip of snout and eye 1 : 4.33, proportion to length of eye 1 : 1.56.

The teeth are obtuse; in the upper jaw about 45 series. All in all the disc is smooth, but spines are to be found on the following places: 4 in a curved line before eye, 2 behind it, 1 at spiracle, 1 on each shoulder or more correctly trace of a lost spine, 27 in the median line on the back and tail before the dorsals; some of these are worn off; 5 between the two dorsals, 15 on the right, 14 on the left side of the tail.

The caudal fin is well developed.

### ***Raia fyllæ,*** Lütken.

1887. *Raia fyllæ,* Lütken (No. 64, pag. 1, pl. I).
1891. „ „ „ (No. 65, pag. 32).
1898. „ „ „ (No. 66, II, 1, pag. 11, pl. II).
1905. „ „ (Lütken), Jensen (No. 51, pag. 227).
1908. „ *sp.*, Holt & Byrne (No. 48, pag. 53).
1914. „ *fyllæ,* (Lütken), Jensen (No. 52, pag. 27).

1 specimen, 38 cm., St. 25 B, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

2 specimens, 46—52 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

These specimens of *Raia fyllæ,* taken west of Ireland and Spain, resemble the typical form as regards the spinous armature (No. 51 pag. 232), the median and the

two lateral series of spines being well developed; there are also indications of a row of small spines at the transition from dorsal to ventral side of the tail, in its narrowest part, near the dorsal fins.

The free portion of the *appendices genitales* is in the large specimen 56.5 mm., in the smaller 11 mm.

The variation in outline of the disc of the body according to size will be seen from the fig. 2. The

Fig. 2. *Raia fyllæ*, Lütken. Contour of the disc.

marginal incurvation at the level of the spiracles is unmistakably most pronounced in the largest specimen; in the smallest the anterior margin is undulated, without any marked incurvation; here also, however, the snout is projecting.

Colour in all cases light on the back, dark on the belly.

Possibly the *Raia* mentioned by HOLT and BYRNE (No. 48, pag. 53) as taken together with *Pristiurus murinus* S. W. of Ireland at 610—664 fathoms may belong to this species.

### *Raia circularis*, Couch.

1870. *Raia circularis*, (Couch), Günther (No. 41, VIII, pag. 462).
1880—84. „ „ (Couch), Day (No. 19, II, pag. 348, pl. CLXXIV).
1895. „ „ (Couch), Holt & Calderwood (No. 46 b, pag. 394).

1 specimen, 30 cm., St. 3, 10/4, N. 49° 32′, W. 15° 49′, 184 m., fine sand.

Some specimens in Portuguese fishing-boat, St. 13, 22/4, N. 41° 32′, W. 9° 05′, 78 m.

1 specimen, 36 cm., St. 39, 21/5, N. 26° 3′, W. 15° 0′, 214 m., fine grey sand.

| | | |
|---|---|---|
| Total length | 359 | mm. |
| Greatest breadth | 207 | „ |
| Tip of snout to hindmargin of cloaca | 165 | „ |
| proportion to greatest breadth: 1 : 1.25. | | |
| Hindmargin of cloaca to tip of tail | 194 | „ |
| proportion to total length: 1 : 1.85, proportion to the distance tip of snout to hindmargin of cloaca: 1 : 1.18. | | |
| Tip of snout to hindmargin of pectoral fin | 179 | mm. |
| proportion to greatest breadth: 1 : 1.16. | | |
| Tip of snout to nostrils | 36 | „ |
| Base of nasal valve | 25.5 | „ |
| Tip of snout to hindmargin of upper jaw | 50 | „ |
| Breadth of disc across centre of eyes | 40 | „ |
| Tip of snout to centre of eyes | 48.5 | „ |
| proportion to breadth of disc across centre of eyes: 1 : 2.46. | | |
| Tip of snout to foremargin of eyes | 40 | „ |
| Interorbital space | 14 | „ |
| proportion to the distance tip of snout to centre of eyes: 1 : 3.46, proportion to the distance tip of snout to foremargin of eyes: 1 : 2.86. | | |
| Length of orbit | 17 | „ |
| Length of cornea | 11 | „ |

In the upper jaw only 42 series of pointed teeth — the specimen 30 cm. has 44 rows.

In the foremost part of the body the spines are found on the rostrum, then in a halfcircle on the innerside of the eye to the spiracle, and finally there are two spines, one before the other on the shoulder with a triangular group of spines between them.

On the tail and on the hind part of the disc the spines are arranged in seven series in all, namely, a median one of small spines, two lateral ones of strong spines and laterally to these a further series of strong spines on each side of the tail only, most distinct in the foremost part.

Besides these five series there is on each side a row of small spines in the entire length of the tail on the limit between the dorsal and ventral side but most distinct in the distal part.

The upper side of the tail, as also that of the disc is rough with small spines partly arranged in rings about the base of the large spines.

The two dorsal fins are situated one just behind the other without spines between, and confluent with the base of the second dorsal is a small caudal fin.

The colour on the upper surface is uniform with exception of the pale space on each side of the rostrum and a large black patch marbled with white on each side of the disc.

### *Raia vomer*, Fries.

1 specimen, St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

***Raia nidrosiensis,*** Collett.

1 specimen, St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

***Raia fullonica,*** Lin.

1870. *Raia fullonica,* (Lin.), Günther (No. 41, VIII, pag. 467).

1 specimen, 53.3 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

### *Myliobatidæ.*

***Myliobatis aquila,*** Cuv.

1870. *Myliobatis aquila,* (Cuv.), Günther (No. 41, VIII, pag. 489).

1 specimen, 44 cm., but the tail is broken. (The length from the tip of snout to the hindmargin of ventral fin is 19 cm.). St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

## ORDER HOLOCEPHALI.

### *Chimæridæ.*

***Chimæra monstrosa,*** Lin.

2 specimens. One 65 cm., the other greater, St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

***Chimæra mirabilis,*** Coll.

Pl. I, fig. 3.

7 specimens, 54—76 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

In the specimen depicted on the plate the caudal filament is broken.

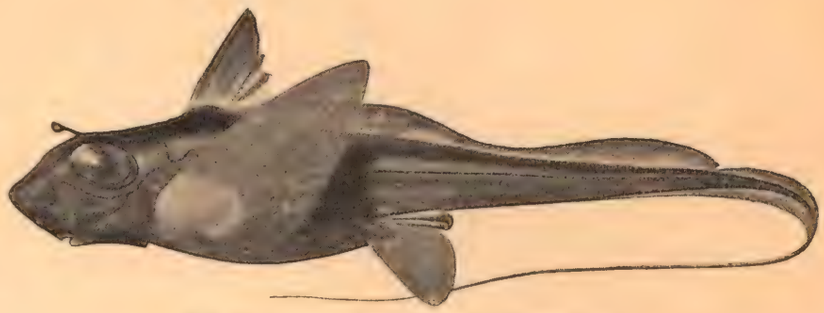


Fig. 3. *Chimæra mirabilis,* Collett, 71 cm.

***Harriotta raleighana,*** Goode & Bean.

Pl. III, figs. 1 & 2.

1894 (1895). *Harriotta raleighana,* Goode & Bean (No. 36, pag. 471, pl. XIX).
1895. „ „ Goode & Bean (No. 37, pag. 32, figs. 37—40).
1904. „ „ (Goode & Bean), Garman (No. 27, pag. 263, pl. 2, figs. 3—5; pl. 4, fig. 1, pl. 5, figs. 3—9).
1908 (1910). „ „ (Goode & Bean), Holt & Byrne, (No. 49, pp. 4, 20).
1910. „ „ (Goode & Bean), Bean & Weed, (No. 3, pag. 662).

1 specimen, 27 cm., St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

2 specimens, 74—86 cm., St. 101, 7/8, N. 57° 41′, W. 11° 48′, 1853 m., hard clay.

On the whole, these answer to the previous descriptions, and it will therefore here suffice, for the most part, to refer to the figures and measurements, mentioning only a few points in particular (figs. 4—6).

In contrast to the young specimen shown by GOODE and BEAN (No. 36, pl. XIX, figs. 3 & 4, No. 37, pl. XI, figs. 39 & 40), the small one here has no spines on the neck or at the base of the median fins; on the largest, however, two small protuberances are apparent on the left side near the forepart of the base of the first dorsal fin. There are also, in the two large ones, small warts or recurvate lobes of skin behind the tip of snout, as mentioned by TANAKA (No. 85, pag. 7) in *Anteliochimæra chætiramphus.* The smallest is a male, with thin, undeveloped claspers.

The anterior dental plates have, in the specimen of 86 cm. (fig. 6) in the upper jaw 8 projecting parts or tritors on the left side, 9 on the right. In the lower, 6 on either side in the front row (conf. No. 23, pag. 120—126, figs. 94, 96, 107—109). In the 74 cm. specimen there are 9 tritors on the left side of the upper jaw, and 10 on the right, with 8 on either side of the lower in the front row. The young specimen has 3 tritors in the upper jaw laterally on the two anterior dental plates, the median, however, being not yet distinctly apparent; tritors on the palatine groups are nevertheless developed; in the lower jaw, only one tritor is apparent in the front row on either side, near the middle; in the lateral group 3 processes.

*Anteliochimæra chætiramphus* has, it is true, only 6 or 7 tritors in the margin of the foremost dental plates, but the number can vary, as we have seen, and it is therefore questionable whether this feature should be used as a specific character. On the other hand, it would seem that both TANAKA and BEAN & WEED (No. 3, pag. 662) are correct in giving a longer snout than in the case of

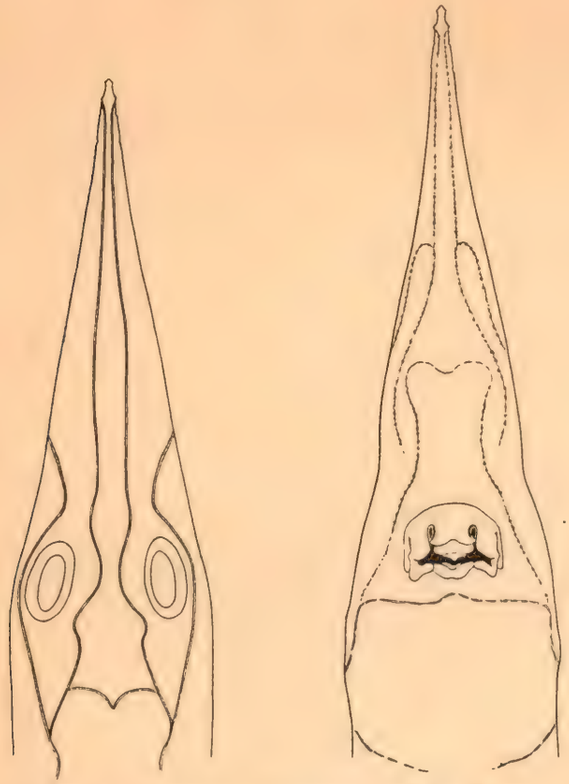


Fig. 4. *Harriotta raleighana*, G. & B., 74 cm. Dorsal and ventral view of the head. (1/2).

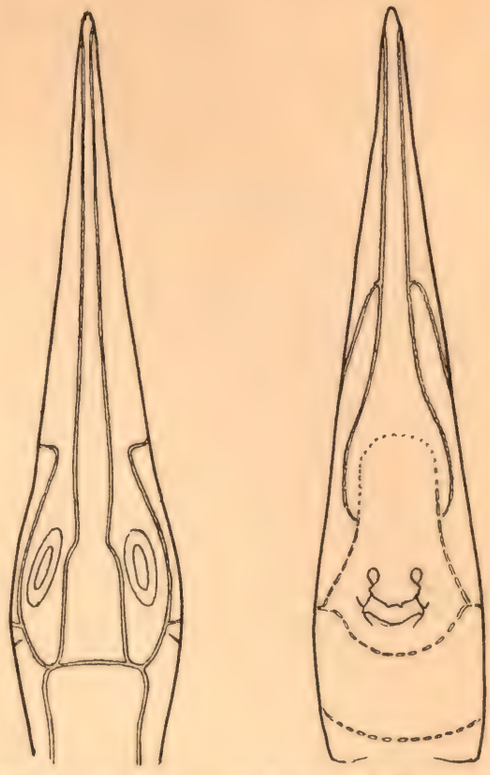


Fig. 5. *Harriotta raleighana*, G. & B., 27 cm. Dorsal and ventral view of the head. (1/1).

*raleighana*. As the eye varies with size of the specimens, it is most distinctly seen by comparing the length of snout with a measurement in which it is not included, and which can also be accurately taken, viz. the distance from posterior margin of the eye to base of the dorsal spine.

Lower jaw. Upper jaw.

Fig. 6. *Harriotta raleighana*, G. & B., 86 cm. Diagram showing the arrangements of the groups of teeth, observed without dissection.

This distance will, in *Anteliochimæra chætiramphus*, go 3 1/2 times into the length of snout (No. 85, pl. I) in a *raleighana* of corresponding size only about 2 1/2 times. We might also compare the length of the snout with length of the postorbital portion of the head, but this measurement is not so easy to take accurately. The proportion here is, for *Anteliochimæra chætiramphus*, postorbital part of head 4 3/4 times in snout, and for *raleighana* of corresponding size 4 1/4. The variation of the eye is contrary to what is generally the case, the eye being comparatively smallest in the youngest specimens.

As to whether *Anteliochimæra chætiramphus* really is a distinct species must, however, be determined by direct comparison, and it is to be hoped that further material may be procured.

| | | | |
|---|---|---|---|
| Total length..... | 265 mm. | 740 mm. | 860 mm. |
| Tip of snout to anus ..... | 134 „ | 334 „ | 394 „ |
| Tip of snout to first dorsal. | 91 „ | 200 „ | 238 „ |
| Tip of snout to second dorsal | 127 „ | 278 „ | 308 „ |
| Tip of snout to supracaudal | 175 „ | 469 „ | 554 „ |
| Tip of snout to infracaudal | 187 „ | 450 „ | 521 „ |
| Tip of snout to end of second dorsal ..... | 174 „ | 439 „ | 526 „ |
| Foremargin of eye to end of second dorsal..... | 113 „ | 314 „ | 374 „ |
| End of second dorsal to supracaudal ..... | 1 „ | 29 „ | 33 „ |
| Height of body at pectorals just before first dorsal... | 33 „ | 76 „ | 96 „ |
| Height of body between dorsals ..... | 39 „ | 90 „ | 111 „ |
| Height of body before base of ventrals ..... | 23 „ | 72 „ | 90 „ |

| | | | |
|---|---|---|---|
| Height of body at origin of infracaudal | 7.5 mm. | 24 mm. | 30 mm. |
| Length of head | 87 „ | 185 „ | 212 „ |
| Tip of snout to basis of vomerine dental plates | 69 „ | 133 „ | 155 „ |
| Tip of snout to eye | 62 „ | 132 „ | 156 „ |
| Breadth of head behind eye | 21 „ | 42 „ | 61 „ |
| Breadth of snout | 12 „ | 41 „ | 41 „ |
| Length of eye | 7 „ | 26 „ | 34 „ |
| Interorbital space | 13 „ | 24 „ | 28 „ |
| Base of nasal valve | 3.2 „ | 9 „ | 10 „ |

| | | | |
|---|---|---|---|
| Foremargin of eye to upper edge of gill-opening | 25 mm. | 57 mm. | 71 mm. |
| Base of first dorsal | 12 „ | 66 „ | 73 „ |
| Base of second dorsal | 48 „ | 169 „ | 218 „ |
| Length of dorsal spine | 22 „ | 89 „ | 105 „ |
| Distance between dorsal insertion of pectoral and ventral | 50 „ | 155 „ | 167 „ |
| Foremargin of pectoral | 47 „ | 139 „ | 157 „ |
| Length of ventral | 31 „ | 65 „ | 70 „ |
| Breadth of pectoral | 30 „ | 77 „ | 80 „ |
| Breadth of ventral | abt. 15 „ | abt. 38 „ | 42 „ |

| Total length | Sex | Snout to anus: Length of head | Snout to supracaudal: Length of head | Foremargin of eye to end of second dorsal: Foremargin of eye to upper edge of gill-opening | Foremargin of eye to end of second dorsal: Length of eye | Foremargin of eye to upper edge of gill-opening: Length of eye | Tip of snout to eye: Foremargin of eye to upper edge of gill-opening | Length of head: Tip of snout to eye | Postorbital length of head: Length of eye | Tip of snout to eye: Postorbital length of head | Hindmargin of eye to dorsal spine: Length of eye | Tip of snout to eye: Hindmargin of eye to dorsal spine | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | |
| 102 | ♂ | — | 3.00 | 5.67 | 17.0 | 3.00 | 1.83 | 1.51 | 2.16 | 2.54 | 3.67 | 1.50 | GOODE and BEAN, Proceed. U. S. nat. mus. XVII, fig. 3. |
| 265 | ♂ | 1.54 | 2.01 | 4.52 | 16.2 | 3.57 | 2.44 | 1.41 | 2.58 | 3.44 | 3.48 | 2.48 | "M. S.", St. 35. |
| 395 | ♂ | *1.86*[1]) | 2.78 | 4.68 | 10.9 | 2.34 | 1.94 | 1.36 | 1.35 | 3.34 | 2.06 | 2.20 | G. & B., Proceed. XVII, fig. 1. |
| 640 | ♀ | *1.75*[1]) | *2.48*[1]) | — | — | — | — | — | 1.27 | 4.30 | — | — | GARMAN, Bull. mus. comp. zool. XLI, plate 2, fig. 4. |
| 740 | ♀ | 1.81 | 2.54 | 5.51 | 12.1 | 2.19 | 2.32 | 1.40 | 1.19 | 4.26 | 2.08 | 2.44 | "M. S.", St. 101. |
| 800 | ♂ | — | 2.46 | 6.50 | 14.1 | 2.18 | 3.30 | 1.30 | 1.50 | 4.71 | 2.0 | 3.5 | TANAKA. |
| 860 | ♀ | 1.86 | 2.61 | 5.27 | 11.0 | 2.09 | 2.2 | 1.36 | 1.09 | 4.22 | 1.77 | 2.60 | "M. S.", St. 101. |

4 eggcapsules were taken in the trawl at St. 41, N. 28° 8′, W. 13° 35′, 1365 metres' depth, and partly the lateral ribbed membrane of a capsula at St. 48, N. 28° 54′, W. 24° 14′, 5000 metres' depth.

One of these (fig. 7) is smaller than the others; the body of the chamber measures abt. 75 mm., is bluntly rounded in front, sharply grooved behind the anterior part; it is thus perhaps from a *Harriotta*. (No. 23, pag. 36, fig. 19; No. 49, pag. 23).

From the groove itself or "neck" to the commencement of the style is 53 mm. From the fore end of the chamber to the style there are abt. 31 ribs in the lateral membrane, from neck to style abt. 20. Colour brown.

The three others are probably eggs of

[1]) After measurements made by GARMAN.

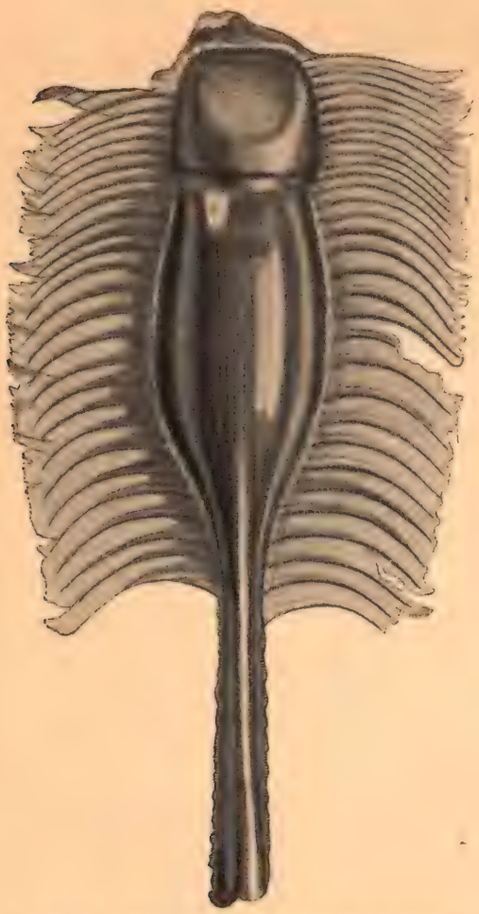


Fig. 7. Egg of *Harriotta raleighana*, G. & B. ? (1/1).

***Rhinochimæra atlantica,*** Holt & Byrne.

Size of the body of the chamber 82, 82 and 100 mm., from the neck to the style 60, 60 and 74 mm. (fig. 8).

The chamber is rounded in front, but somewhat more tapering than in the foregoing, the narrowed portion only a slight incurvation. From the fore end of the chamber to the style are 32, 45 and 40 ribs in the lateral flap, from the neck to the style 22, 30 and 20 ribs. In the capsule having greatest number of ribs in the lateral membrane, some ribs do not reach right in to the chamber, others not right to the margin of the membrane. The largest capsule is brown, the two others almost black. The membrane from St. 48 should, from its breadth, also belong to *Rhinochimæra;* colour brown.

(Cf. HOLT & BYRNE No. 49, pp. 18—23; pl. IV).

Fig. 8. Egg of *Rhinochimæra atlantica*, Holt & Byrne. ? (1/1).

# Subclass Teleostomi.

## ORDER TELEOSTEI.

### SUBORDER MALACOPTERYGII.

#### *Clupeidæ.*

***Engraulis encrasicholus,*** Cuv.

Many specimens, 4—12 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

***Clupea alosa,*** Lin.

1 specimen, 21 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

***Clupea pilchardus,*** Walbaum.

Many specimens, 4—10 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

***Clupea (Sardinella) granigera,*** Cuv. & Val.

1847. *Sardinella granigera,* Cuvier & Valenciennes (No. 18, XX, pag. 193).
1868. *Clupea granigera,* (Cuv. & Val.), Günther (No. 41, VII, pag. 421).
1920. *Sardinella granigera,* (Cuv. & Val.), Fage (No. 24 a, pag. 124).

27 specimens, 95—147 mm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

27 were preserved, but the Spanish fishermen took a quantity in the net which they were dragging close in to shore to catch bait for their lines when fishing for *Sparidæ* far out in deeper water.

Description of the largest specimen:—

Total length 147 mm.

Length of body 119 mm.

Height of body at commencement of D. 34.2 mm.; proportion to length of body 1 : 3.48.

Length of head from point of snout to posterior margin of operculum, 32.5 mm.; proportion to length of body 1 : 3.66.

Horizontal diameter of eye 9.0 mm.; proportion to length of head 1 : 3.61.

Length of snout 8.5 mm.

Postorbital length of head 13 mm.

Height of operculum 16 mm. Breadth 6 mm.

Point of snout to dorsal fin, 51 mm.

From foremost ray in D. to foremost in C. 61.5 mm.

Length of pectoral fin 21.5 mm.

Pectoral fin to ventral 32 mm.

No. of rays in D. 20; in A. 21; in V. 8.

14 keeled scales between V. and A.

46 vertebræ.

The lover jaw projects only slightly in front of the upper. The upper jaw is only slightly concave, and reaches almost to the vertical for centre of the iris. The eye has large transparent eyelids. A single row of teeth in the middle of the tongue. In some specimens, a series of feeble teeth may be seen on the palatal bones and the mandible. The gill-cover is smooth, the branchial cavity black. The teeth of the branchial arch long and closely set. The ventral fins below the foremost half of the dorsal. There are two lines of pointed imbricate scales on either side of the base of the caudal fin. The dark-coloured portion of the back extends along the four uppermost rows of scales. There is a dark spot at the base of the first rays in the dorsal fin as also on the shoulder, the last more or less visible. The points of the caudal fin are black.

The scales resemble those of *Clupea (Sardina) pilchardus,* but the free portion is perforated and more pointed in the centre.

The above description shows that the fish belongs to the species *Clupea granigera.* As mentioned, the upper jaw is only slightly concave; the eyes have large eyelids, the gill-cover is smooth, and the inner portion of the caudal fin has two stripes of pointed imbricate scales. These are just the characters wich ANTIPA gives for the genus *Sardinella* (No. 2, pag. 54). In other words, *Clupea granigera* should be included in the genus *Sardinella.*

This capture of *Sardinella granigera,* CUV. & VAL., off the north-west coast of Africa, shows that its distribution is not so restricted as presumed (No. 24 a, pag. 125).

Total length of the specimens in mm.: 95, 115, 117, 120, 121, 122, 123, 123, 123, 123, 124, 124, 125, 125, 128, 129, 130, 131, 133, 134, 135, 136, 136, 137, 138, 138, 147.

#### *Salmonidæ.*

***Argentina sphyræna,*** Lin.

5 specimens, 9—10 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

4 specimens, one measured 14 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

***Argentina silus,*** Nilss.

5 specimens, 3 of them measured 6—7 cm., St. 39 B, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

## *Alepocephalidæ.*

### Alepocephalus.

As a character for the genus *Alepocephalus* it is mentioned that the maxilla lacks teeth.

HOLT and BYRNE (No. 48, pag. 38), however, state, that a young *Alepocephalus giardi* 72 mm. long has few and very small teeth on the maxilla.

True, RISSO says: "Maxillæ et ossa palatina denticulis curvatis instructæ" (No. 77, pag. 449), but he evidently intends "maxillæ" to mean "upper and lower jaw", for in his description of the species *A. rostratus* he writes: "Les mâchoires sont avancées, l'inférieure s'emboîte avec "la supérieure quand la bouche se ferme; toutes les deux "sont garnies d'une rangée de très fines dents" (No. 77, pag. 450).

That this refers to teeth fixed on the bone is evident from GEGENBAUR: "Von den Oberkieferknochen ist das "Præmaxillare zwar nicht sehr ansehlich, begrenzt aber "doch den grössten Theil des Oberrandes der Mundspalte... "wie bekannt trägt es eine Reihe feiner Zähne, die dem "Maxillare abgehen." (No. 28, pag. 13).

We find, however, in the species *rostratus, giardi, agassizii, productus, macropterus* and *murrayi* here investigated, teeth in the integument of the maxilla. In *macropterus* they are on the edge, otherwise they are found also up on the sides of the maxilla, especially on the inner side.

***Alepocephalus rostratus,*** Risso.

Pl. I, fig. 2.

| | | | |
|---|---|---|---|
| 1826. | *Alepocephalus rostratus,* | Risso (No. 77, pag. 449). |
| 1846. | „ | „ | (Risso), Cuvier & Valenciennes (No. 18, pag. 172, pl. 566). |
| 1868. | „ | „ | (Risso), Günther (No. 41, VII, pag. 477). |
| 1887. | „ | „ | „ Günther (No. 43, pag. 223). |
| 1888. | „ | „ | „ Vaillant (No. 86, pag. 148, pl. XI & XII). |
| 1895. | „ | „ | (Risso), Goode & Bean (No. 37, pag. 36, pl. XII, fig. 41). |
| 1906 (1908). | „ | „ | (Risso), Holt & Byrne (No. 48, pag. 32, pl. III, fig. 1). |
| 1919. | „ | „ | (Risso), Roule (No. 79 c, pag. 5). |

7 specimens, abt. 7—52 cm., St. 4, 11/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

5 specimens, 26—53 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m.

1 specimen, 33 cm., St. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

5 specimens, 27—57 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

D. 17—20, A. 19—24, V. 7—9, P. 9—10, lat. line about 52—55.

The height of body goes 4 to 5 times into the length of same save in one large specimen, where it goes $5^1/_2$ times, and in the two small specimens where the proportion between height of body and length of same is as abt. 1 : 6 and abt. 1 : $5^3/_4$. Usually, however, the young fish are more slender than the adults; the fact that the specimen with length of body 57 mm. is proportionally higher than that with length of body 90 mm. is owing to the presence in the smaller specimen of a fold of cutaneous membrane along the belly in addition to the dorsal fold.

The height of the tail goes from $3^3/_4$ to over 5 times into the length of the head. The length of the caudal peduncle measured from the last ray of the dorsal fin to the middle of the base of the caudal fin is, as regards those investigated, in two cases equal to half the length of head, in the rest, greater than half the length of the head, but always less than $^2/_3$ of the head.

The head goes 3—$3^1/_2$ times into the length of the body. The eye is in most cases slightly larger than the snout; in four cases, however, it is equal to this, and in two slightly less. The snout is slightly smaller in proportion to the length of body than stated by GOODE and BEAN in their table (No. 37, pag. 36), the proportion of snout to length of body being 10.40—13.80.

The lower jaw is embraced by the upper, so that the "Michael Sars" specimens do not support HOLT and BYRNE's statement "jaws subequal or with the lower slightly projecting" (No. 48, pag. 33). The præmaxilla, palatina and the dentalium of the lower jaw have teeth, the vomer, however, has none. On the tongue also none have been seen. The skin round the edge of the maxilla has small teeth, especially on the inner side towards the lower jaw; this has therefore also teeth in the skin where it lies against the upper jaw. The width of the frontalia is sometimes slightly less, sometimes a little greater than $^2/_3$ of the eye.

Dorsal to the base of pectoral fin is situated a cutaneous lobe.

CUVIER & VALENCIENNES (No. 18, vol. XIX, pag. 172, 175), as also GÜNTHER (No. 41, vol. VII, pag. 477, No. 43, pag. 223), mention 12 pyloric appendages; in two of our specimens, however, 17 were found. Of these 17, nos. 7 and 8 are bifurcate. The specimens in question were one of 31.5 cm. from St. 23, and one of 35 cm. from St. 41.

Beyond this, there is nothing to remark, save for the

fact that the compressed dorsal fold mentioned by HOLT & BYRNE as a character of *Alepocephalus rostratus,* is present in all the specimens. (No. 48, pag. 32, 33, figs. 1 & 2, pag. 34, 39).

| Total length | Length of body | Height of body | Height of caudal peduncle | Dorsal to base of caudal | Length of head | Snout to eye | Horizontal diam. of eye | Width of frontalia opposite centre of eyes | Dorsal fin rays | Anal fin rays | Pectoral fin rays | Ventral fin rays | Lateral line | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | |
| — | 57 | 10 | 3.8 | 10.2 | 20 | 5.5 | 6.5 | 3 | 18? | 21? | — | — | above 50 | 4 |
| 100 | 90 | 15.2 | 6.5 | 16 | 30.2 | 7.5 | 10 | 4.7 | 18 | 21 | 10 | 7 | 52 | 4 |
| abt. 260 | 220 | 51 | 17 | 40 | 72 | 18.5 | 21 | — | 19 | 24 | 10 | 9 | 54 | 23 |
| 270 | 240 | 54 | 20 | 41.5 | 78 | 20 | 23 | 13 | 19 | 20 | 10 | 8 | 55 | 41 |
| 315 | 270 | 56 | 23 | 51 | 86 | 22 | 21.5 | — | 18 | 21 | 10 | 8 | 54 | 23 |
| abt. 330 | 285 | 51 | 18 | 47.5 | 94 | 25.5 | 27 | 15 | 18 | 20 | 10 | 8 | 54 | 24 |
| 350 | 312 | 70 | 25 | 56 | 96 | 26 | 26 | 17 | 17 | 21 | 10 | 7 | 54 | 41 |
| 380 | 335 | 71 | — | — | 101 | 25 | 27 | — | 18 | 23 | 10 | 7 | 54 | 4 |
| 450 | 392 | 83 | — | — | 117 | 30 | 30 | — | 17 | 23 | 10 | 7 | 53 | 4 |
| 450 | 395 | 88 | — | — | 121 | 30.5 | 32 | — | 18 | 21 | 10 | 8 | 54 | 23 |
| 460 | 400 | 93 | — | — | 122 | 31 | 32 | 20 | 19 | 22 | 10 | 8 | 54 | 41 |
| 470 | 410 | 102 | — | — | abt. 119 | 30 | 31 | — | 18 | 23 | 10 | 8 | 55 | 23 |
| 520 | 455 | 97 | 36 | — | 131 | 34 | 38 | 30 | 18 | 21 | 10 | 8 | 53 | 4 |
| 520 | 455 | 98 | — | — | 133 | 33 | 37 | — | 17 | 20 | 10 | 8 | 52 | 4 |
| 520 | 455 | 104 | — | — | 136 | 34 | 36 | — | 20 | 22 | 10 | 8 | 55 | 4 |
| 520 | 460 | 112 | — | — | 140 | 34 | 34 | 24 | 17 | 21 | 10 | 8 | 55 | 41 |
| 530 | 465 | 110 | — | — | 143 | 37 | 36 | — | 18 | 21 | 9 | 7 | 55 | 23 |
| 570 | 495 | 115 | — | — | 147 | 37 | 37 | 26.5 | 17 | 19 | 9 | 8 | 55 | 41 |

| Total length | Length of body | Length of body: Height of body | Length of head: Height of caudal peduncle | Length of body: Length of head | Length of body: Length of snout | Length of head: Length of eye | Station |
|---|---|---|---|---|---|---|---|
| mm. | | | | | | | |
| — | 57 | 5.70 | 5.26 | 2.85 | 10.40 | 3.08 | 4 |
| 100 | 90 | 5.92 | 4.64 | 2.98 | 12.00 | 3.02 | 4 |
| abt. 260 | 220 | 4.31 | 4.23 | 3.06 | 11.90 | 3.42 | 23 |
| 270 | 240 | 4.44 | 3.90 | 3.08 | 12.00 | 3.39 | 41 |
| 315 | 270 | 4.82 | 3.74 | 3.14 | 12.28 | 4.00 | 23 |
| abt. 330 | 285 | 5.59 | 5.21 | 3.06 | 11.40 | 3.48 | 24 |
| 350 | 312 | 4.46 | 3.84 | 3.26 | 12.00 | 3.69 | 41 |
| 380 | 335 | 4.72 | — | 3.32 | 13.40 | 3.74 | 4 |
| 450 | 392 | 4.72 | — | 3.35 | 13.08 | 3.90 | 4 |
| 450 | 395 | 4.49 | — | 3.26 | 12.92 | 3.88 | 23 |
| 460 | 400 | 4.30 | — | 3.28 | 12.90 | 3.81 | 41 |
| 470 | 410 | 4.02 | — | 3.44 | 13.68 | 3.84 | 23 |
| 520 | 455 | 4.69 | — | 3.48 | 13.40 | 3.44 | 4 |
| 520 | 455 | 4.65 | — | 3.42 | 13.80 | 3.60 | 4 |
| 520 | 455 | 4.36 | — | 3.34 | 13.40 | 3.78 | 4 |
| 520 | 460 | 4.11 | — | 3,28 | 13.53 | 4.12 | 41 |
| 530 | 465 | 4.23 | — | 3.26 | 12.56 | 3.96 | 23 |
| 570 | 495 | 4.30 | — | 3.37 | 13.38 | 3.97 | 41 |

***Alepocephalus giardi,*** Koehler.

1896. *Alepocephalus giardi,* Koehler (No. 57, pag. 513, pl. XXVI, fig. 1).
1905 (1909). *Alepocephalus giardi,* (Koehler), Collett (No. 14 b, pag 40, pl. I, fig. 5).
1906 (1908). „ „ (Koehler), Holt & Byrne (No. 48, pag. 36, pl. III, fig. 2, pl. IV, figs. 1, 2).

1 specimen, 72 cm., St. 4, 11/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

1 specimen, 60 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m.

3 specimens, 39—49 cm., St. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

2 specimens, 24—62 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

D. 20—23, A. 23—25, V. 8—9, P. 10—13, lat. line about 64—70.

Præmaxilla, palatina, the dentalium of the lower jaw and the tongue have teeth. On the tongue, the teeth are closest set at the point and sides. In one specimen of 72 cm. from St. 4, they are here placed in two lateral

groups. Small teeth are found in the skin of the maxilla and on the lower jaw, where this meets the upper, giving the skin a grained appearance.

Dorsal to the base of pectoral fin is placed a triangular cutaneous lobe, adipose in large specimens.

A small *Alepocephalus,* length of body 55 mm., from St. 23, probably belongs to the species *giardi.*

Partly on account of damage, partly from the fact that the scale covering is not yet fully developed, it is impossible to determine exactly the number of scales in the lateral line, but the figure may be stated as about 70.

The deviations found in the proportions of the body may be accounted for as due to the youth of the specimen. The proportions between corresponding parts in HOLT and BYRNE's young specimen of 35 mm. (No. 48, pag. 38) tend in the same direction, albeit not to so high a degree, as in the present young specimen. Thus in HOLT and BYRNE's fig. 2, pl. IV, the proportion between height of caudal peduncle and length of head is 5.58, that between head and length of body 2.80, between length of snout and length of body 9.40, while the corresponding proportions in the present specimen are 6.03, 2.34, and 8.46 respectively.

| Total length | Length of body | Height of body | Height of caudal peduncle | Dorsal to base of caudal | Length of head | Length of snout | Horiz. diam. of eye | Width of frontalia opposite centre of eyes | Snout to dorsal | Snout to ventral | Dorsal fin rays | Anal fin rays | Pectoral fin rays | Ventral fin rays | Lateral line | Appendices pyloricæ | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | |
| — | 55 | 10 | 3.9 | 10.5 | 23.5 | 6.5 | 7 | — | 38 | 31 | 19 or 20 | 22 or 23 | abt. 12 | 8 | nearly 70 | — | 23 |
| abt. 240 | 205 | 35 | 14 | 41 | 71 | 17 | 20 | 12 | 137 | 109 | abt. 20 | abt. 23 | 11 | 8 | abt. 67 | 16 | 41 |
| abt. 390 | 347 | 56 | 29 | 71 | 114 | 27 | 30 | 20 | 235 | 176 | 20 | 23 | 11 | 8 | abt. 67 | — | 24 |
| 400 | 352 | 65 | 31 | 71.5 | 116 | 26 | 31 | 22 | 237 | 178 | 21 | 23 | 11 | 8 | abt. 64 | — | 24 |
| 490 | 445 | 84 | 37 | 94 | 132 | 30 | 33.8 | 25.7 | 291 | 213 | 21 | 23 | 10 | 8 | abt. 65 | — | 24 |
| 600 | 550 | 110 | 47.8 | — | 155 | 33 | 35 | 29 | abt 350 | abt 260 | 22 | 24 | 13 | 9 | 67—70 | — | 23 |
| | | | | | | | | | | | | | | dext.–sin. | | | |
| 620 | 580 | 110 | 53 | — | 164 | 32 | 35 | 30 | 383 | 268 | 22 | 25 | 12 | 8 9 | 68 | 13 | 41 |
| 720 | 660 | 121 | 57 | — | 175 | 33 | 37 | 35 | abt 400 | abt 290 | 23 | 25 | 12 | 8 | abt. 67 | 15 | 4 |

| Total length | Length of body | Length of body: Height of body | Length of head: Height of caudal peduncle | Length of body: Length of head | Length of body: Length of snout | Length of head: Horiz. diam. of eye | Length of head: Length of snout | Snout to dorsal: Length of head | Length of body: Snout to ventral | Snout to ventral: Length of head | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | |
| — | 55 | 5.5 | 6.03 | 2.34 | 8.46 | 3.36 | 3.62 | 1.62 | 1.78 | 1.32 | 23 |
| abt. 240 | 205 | 5.86 | 5.06 | 2.89 | 12.08 | 3.54 | 4.17 | 1.93 | 1.88 | 1.54 | 41 |
| abt. 390 | 347 | 6.25 | 3.94 | 3.07 | 12.99 | 3.80 | 4.22 | 2.06 | 1.97 | 1.54 | 24 |
| 400 | 352 | 5.42 | 3.74 | 3.04 | 13.52 | 3.74 | 4.46 | 2.04 | 1.98 | 1.53 | 24 |
| 490 | 445 | 5.30 | 3.57 | 3.37 | 14.83 | 3.90 | 4.40 | 2.20 | 2.09 | 1.61 | 24 |
| 600 | 550 | 5.00 | 3.24 | 3.55 | 16.67 | 4.53 | 4.70 | 2.26 | 2.12 | 1.68 | 23 |
| 620 | 580 | 5.27 | 3.10 | 3.54 | 18.11 | 4.68 | 5.13 | 2.34 | 2.16 | 1.63 | 41 |
| 720 | 660 | 5.45 | 3.07 | 3.77 | 20.00 | 4.73 | 5.30 | 2.28 | 2.28 | 1.66 | 4 |

***Alepocephalus agassizii,*** Goode & Bean.

1882. *Alepocephalus agassizii,* Goode & Bean (No. 35, pag. 218).
1895. „ „ Goode & Bean (No. 37, p. 37, fig. 45).
1898. „ „ (Goode & Bean), Lütken (No. 66, p. 8).

2 specimens, 52 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

3 specimens, 37—56 cm., St. 101, 6-7/8, N. 57° 41′, W. 11° 48′, 1853 m., hard clay.

D. 16—17, A. 17—18, V. 6—7, P. 10—12, lat. line 80—90.

Height of body goes about $4^1/_2$—$5^1/_3$ times into length.

The height of the caudal peduncle goes 12—15 times into the length of the body, and $4^1/_5$ to $5^1/_3$ times into that of the head. In length, the caudal peduncle is equal to about $^1/_5$ the length of the body.

The length of head is about $^1/_3$ that of the body, and a little over twice as long as the lower jaw. The opercular flap reaches beyond the basis of the pectoral fin, so that the postorbital portion of the head makes up a little more than half the head's whole length, its proportion thereto being 1.74—1.84. The proportion of eye to head is as 1 : 3.68—4.23 and to the length of the body as 1 : 10.89—12.23, it is larger than the snout, which goes 4—$4^2/_3$ times into the length of the head, and is barely half as long as the lower jaw. The maxilla reaches to midway under the eye, or to the posterior margin of it; it appears to have had small teeth in the skin, but these are now damaged. There are also teeth on the præmaxilla, palatina and mandible; none, however, have been observed on the tongue. The mandible is embraced by the præmaxilla and maxilla, but has a projecting chin. The greatest breadth of the head is about equal to the length of the gill-cover, and goes 8 to $9^1/_4$ times into the length of the body.

(Total length in cm.; the other measurements in mm.).

| Total length | Length of body | Height of body at pectoral | Height of body at anus | Height of caudal peduncle | Length of caudal peduncle | Length of head | Length of snout | Horiz. diam. of eye | Breadth of the crown | Length of postorbital part of head | Snout to anus | Anus to base of caudal | Snout to dorsal | Origin of dorsal to base of caudal | Anterior margin of eye to base of caudal | Snout to ventral | Base of dorsal | Base of anal | Dorsal fin rays | Anal fin rays | Ventral fin rays | Pectoral fin rays | Lateral line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | 320 | 61 | 46 | 26 | 61 | abt. 114 | 25.5 | 28 | 36 | abt. 60.5 | 214 | — | — | 99 | 294 | 180 | 39 | 40 | 17 | 17 | 6 | 10 | abt. — |
| abt. 52 | 462 | 90 | 73 | 35 | 90 | 151 | 37 | 41 | 50 | 87 | 300 | 150 | 320 | — | — | 250 | 57 | 57 | 17 | 17 | 7 | 11 | 80 |
| abt. 52 | 467 | 104 | 80 | 35 | 92 | 158 | 34 | 43 | 55 | 86 | 303 | 165 | 328 | 147 | 427 | 267 | 56 | 57 | 17 | 18 | 7 | 12 | 80 |
| | | | | | | | | | | | | | | | | | | | | | | d. s. | |
| 54 | 477 | 89 | 72 | 38 | 94 | 160 | 36 | 39 | 53 | 85 | 313 | — | — | 145 | 443 | 262 | 53 | 58 | 16 | 18 | 7 | 11 12 | — |
| 56 | 500 | 104 | 75 | 34 | 97 | 182 | 41 | 43 | 63 | 98 | 333 | — | — | 157.5 | 470 | 276 | 62 | 62 | 17 | 18 | 7 | 11 | 90 |

| Total length | Length of body | Length of body: Height of body | Length of body: Height of caudal peduncle | Length of head: Height of caudal peduncle | Length of body: Length of caudal peduncle | Length of body: Length of head | Length of head: Postorb. part of head | Length of head: Horiz. diam. of eye | Length of body: Horiz. diam. of eye | Length of head: Length of snout | Length of body: Breadth of crown | Ant. marg. of eye to base of caudal: Origin of dorsal to caudal | Length of body: Base of dorsal | Length of body: Base of anal | Snout to ventral: Length of head |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | 320 | 5.25 | 12.3 | 4.38 | 5.25 | 2.81 | 1.89 | 4.07 | 11.41 | 4.47 | 8.90 | 2.97 | 8.20 | 8.00 | 1.58 |
| abt. 52 | 462 | 5.14 | 13.20 | 4.31 | 5.14 | 3.06 | 1.74 | 3.68 | 11.29 | 4.08 | 9.25 | — | 8.11 | 8.11 | 1.66 |
| abt. 52 | 467 | 4.49 | 13.30 | 4.52 | 5.08 | 2.97 | 1.84 | 3.68 | 10.89 | 4.65 | 8.5 | 2.91 | 8.34 | 8.20 | 1.69 |
| 54 | 477 | 5.36 | 12.58 | 4.21 | 5.08 | 2.98 | 1.88 | 4.10 | 12.23 | 4.44 | 9.00 | 3.06 | 9.00 | 8.23 | 1.64 |
| 56 | 500 | 4.81 | 14.7 | 5.35 | 5.16 | 2.74 | 1.86 | 4.23 | 11.61 | 4.44 | 7.94 | 2.98 | 8.06 | 8.06 | 1.52 |

The anus lies about at the commencement of the posterior third of the body. Close behind the vertical of the anus the dorsal fin commences; the distance from its commencement to the middle of the caudal fin's base is 1/3 the distance from the latter to the anterior margin of the eye. The base of the dorsal fin and that of the anal are about equal, in length, and go 8 to 9 times into the length of the body, being less than the height of the body at the anus. According to GOODE and BEAN (No. 35, pag. 219; No. 37, pag. 37) the base of the dorsal fin should be 1/8 the total length, that of the anal, however, 1/7 of the body length, and equal to the height of the body at the anus. The ventral fins are situate slightly in rear of the middle of the body — head included — or just in the middle of the belly including the caudal fin; their distance from the point of the snout is $1^1/_2$—$1^2/_3$ times the length of the head. Dorsal to the base of pectoral fin is situated a triangular adipose lobe of skin.

The scales of the lateral line are very difficult to count owing to damage; they must, however, have numbered between 80 and 90.

### *Alepocephalus productus*, Gill.

1883. *Alepocephalus productus*, Gill (No. 32, pag. 256).
1895. „ „ (Gill), Goode & Bean (No. 37, pag. 37, fig. 46).

1 specimen, 38 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

D. 17, A. 17, V. 7, P. 10, lat. line abt. 70.

The height of the body goes only $5^3/_4$ times into its length, and is thus in this specimen less than stated by GILL (No. 37, pag. 37); according to the drawing in Oceanic Ichthyology (No. 37, pl. XIII, fig. 46), however, the proportion is about $4^3/_4$, and not 4 as stated in GILL's description. The height of the caudal peduncle goes about $2^1/_3$ times into that of the body, and $4^2/_3$ times into the length of the head; its length is as nearly as possible half that of the head. There is very little difference between the height of the body at the pectoral fin and at the anus.

The length of the head is 1/3 that of the body, the length of the eye barely 1/4 that of the head, that of the snout 1/3 of this. The posterior margin of the eye is slightly nearer the posterior edge of the opercular flap than the point of the snout, there is so little difference here, however, that the postorbital portion of the head is almost equal to half the length of the head. The upper jaw reaches almost right under the anterior margin of the pupil, as in GOODE and BEAN's figure; their text, however, states that it goes to the posterior margin of the pupil (No. 37, pag. 38). Round the edge of the maxilla teeth are visible in the skin, though only slightly. The mandible is barely half the length of the head. The width of the frontalia is about 1/8 the length of the head, the greatest breadth of head about 1/3. The crown projecting sharply behind the eye and being distinctly marked by a protuberance in the posterior margin of the eye and one at the commencement of the operculum.

The dorsal fin commences in the last third of the body, just behind the anus; the anal fin commences immediately under the dorsal fin. Their bases are of almost the same length, being less than twice the diameter of the eye. From the description in Oceanic Ichthyology, the base of the anal fin should be less than that of the dorsal, and this equal to twice the length of the eye; in the figure, it is true, the base of the anal fin is less than that of the dorsal, but both are less than twice the diameter of the eye.

Total length in cm.; the other measurements in mm.

| | |
|---|---|
| Total length | 38 |
| Length of body | 345 |
| Height of body at pectoral | 60 |
| Height of body at anus | 53 |
| Height of caudal peduncle | 25 |
| Dorsal to base of caudal | 60 |
| Length of head | 117 |
| Horizontal diam. of eye | 28 |
| Length of snout | 35 |
| Width of frontalia opposite centre of eyes | 15 |
| Breadth of the crown | 37.2 |
| Length of postorbital part of head | 57 |
| Snout to dorsal fin | 245 |
| Snout to anus | 224 |
| Base of dorsal | 46 |
| Base of anal | 47 |
| Snout to pectoral | 126 |
| Snout to ventral | 190 |
| Dorsal fin rays | 17 |
| Anal fin rays | 17 |
| Pectoral fin rays | 10 |
| Ventral fin rays | 7 |
| Scales in lateral line | abt. 70 |
| Length of body: Height of body at pectoral | 5.75 |
| Height of body at pectoral: Height of body at anus | 1.13 |
| „ „ „ : Height of caudal peduncle. | 2.40 |
| Length of head: Height of caudal peduncle | 4.68 |
| „ „ : Length of caudal peduncle | 1.95 |
| Length of body: Length of head | 2.95 |
| Length of head: Horizontal diam. of eye | 4.18 |
| „ „ : Length of snout | 3.34 |
| „ „ : Width of frontalia opposite centre of eyes | 7.80 |
| „ „ : Breadth of the crown | 3.14 |
| „ „ : Postorb. part of head | 2.06 |
| Length of body: Snout to pectoral | 2.74 |

The distance from point of snout to the pectoral fin goes $2^{3}/_{4}$ times into the length of body, not 4 times, as stated in Oceanic Ichthyology, but the distance from point of snout to pectoral fin in the figure corresponds to that measured on the fish from the "Michael Sars". The ventral fins are placed behind the centre of body, considerably nearer the anus than the pectoral fins. On either side of the anus, which is comparatively small, there is a large abdominal pore.

***Alepocephalus australis,*** Barnard. (?)

Pl. IV, figs. 5 & 6.

1923. *Alepocephalus australis,* Barnard (2 a, pag. 440) (?)

2 specimens, about 20—24 cm., St. 35, 18-19/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

1 specimen, abt. 50 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

D. 17—19, A. 18—19, V. 7, P. 11—13, lat. line abt. 55-60.

The proportion of height of body to length is in the large specimen 4.84; in the small ones 6.10 and 6.18. The height of body decreases gradually towards the caudal fin, the proportion between this dimension at the pectoral fin and the same at the anal being 1.42—1.50 and above the caudal peduncle 2.52—2.84. The height of the caudal peduncle also, goes $4^{1}/_{2}$ times into the length of the head in the large, and $5^{1}/_{2}$—6 times in the two small specimens. The length of the caudal peduncle goes about twice into the length of the head.

The profile of the head is fairly sharp, the upper contour sloping gradually from the neck towards the point of the snout, and making only a slight arch above the eye. The angle between the upper contour of the snout and the mandible is 50°. The snout and frontalia are narrow, but the crown very broad.

In the large fish, the head goes 3 times into the length of the body; in the smaller ones $2^{3}/_{5}$ and $2^{4}/_{5}$ times. The eye is equal to the snout in the smaller fish, and its proportion to the length of head 3.34 and 3.41; in the large fish, the eye is smaller than the snout, and its proportion to this as 1 : 1.26, and to the head as 1 : 4.14. The proportion of the snout to the head is as 1 : 3.30—3.41.

The maxilla reaches to the anterior margin of the eye; in the large specimen, teeth in the skin are visible in the inner side of the maxilla, where this has not sufferred damage. The width of frontalia goes from $7^{1}/_{4}$ to $8^{1}/_{3}$ times into the length of head. The crown, however, juts out markedly behind the eye, and thus goes only three times into the head. Behind the eye there is a bony process, and another on the anterior corner of the operculum, from this 4 ridges run out fanwise to the operculum, these are distinct in the younger specimens, but have almost disappeared in the old. The ventral fins are placed slightly in rear of the centre of the body. The position of the anus is about where the last third of the body begins. Just above the anus is the commencement of the dorsal fin. Under the foremost rays of this the anal fin commences, and as its base is slightly longer than that of the dorsal, its 3—4 last rays are behind the dorsal fin. In the lateral line the large specimen has 55—60 scales, the small ones about 60. In an oblique row running forward there are 8 scales between the lateral line and the base of the anal and dorsal fins. Along the back, a fold runs from the neck to the dorsal fin; it is indistinct in the large fish, but very marked in the smaller specimens.

| | mm. | mm. | mm. |
|---|---|---|---|
| Total length | 200 | 235 | 500 |
| Length of body | abt.183 | abt.210 | 440 |
| Height of body at pectoral | 30 | 34 | 91 |
| Height of body at anus | 20 | 24 | 64 |
| Height of caudal peduncle | 11.5 | 13.5 | 32 |
| Length of caudal peduncle | 31 | 39 | 75 |
| Length of head | 70 | 75 | 145 |
| Horizontal diam. of eye | 21 | 22 | 35 |
| Length of snout | 21 | 22 | 44 |
| Width of frontalia between eyes | 9 | 9 | 20 |
| Breadth of the crown | 23 | 24 | 47 |
| Snout to ventral | 99 | 115 | 242 |
| Snout to anus | 118 | 135 | 285 |
| Snout to dorsal | 129 | 143 | 308 |
| Base of dorsal | 24 | 25 | 51 |
| Base of anal | 28 | 30 | 57 |
| Dorsal fin rays | 18 | 19 | 17 |
| Anal fin rays | 18 | 19 | 19 |
| Pectoral fin rays | 11 | 13 | 11 |
| Ventral fin rays | 7 | 7 | 7 |
| Lateral line | abt. 60 | abt. 60 | 55—60 |
| Length of body: Height of body at pectoral | 6.10 | 6.18 | 4.84 |
| Height of body at pectoral: Height of body at anus | 1.50 | 1.42 | 1.42 |
| Height of body at pectoral: Height of caudal peduncle | 2.61 | 2,52 | 2.84 |
| Length of head: Height of caudal peduncle | 6.09 | 5.55 | 4.53 |
| „ „ : Length of caudal peduncle | 2.19 | 1.92 | 1.93 |
| Length of body: Length of head | 2.62 | 2.80 | 3.04 |
| Length of head: Horiz. diam. of eye | 3.34 | 3.41 | 4.14 |
| „ „ : Length of snout | 3.34 | 3.41 | 3.30 |
| Length of snout: Horiz. diam. of eye | 1.00 | 1.00 | 1.26 |
| Length of head: Width of front. between eyes | 7.80 | 8.34 | 7.25 |
| „ „ : Breadth of crown | 3.04 | 3.12 | 3.08 |
| Station | 35 | 35 | 95 |

These three *Alepocephalus* are probably identical with *Alepocephalus australis* BARNARD (No. 2 a, pag. 440)

yet *A. australis* BARNARD has only 53—55 scales in the lateral line (No. 2 a, pag. 441) against abt. 58 and 60 scales on the specimens here described; it has also a lower number of finrays, D. 16—17, A. 16—17 and P. 10 (No. 2 a, pag. 441). Further the maxilla is a little longer. But as BARNARD has not given a figure of the species the question is difficult to settle.

Else these 3 fish resemble most *A. asperifrons* GARMAN, but they have no such keels on the frontals as those described by GARMANN (No. 26, pag. 291, pl. LIX, fig. 1), and from which he has named the species. *A. blanfordi* ALCOCK also they resemble greatly, but are distinguished from this by having only about 60 scales in the lateral line, whereas *blanfordi* has 70 (No. 1 a, pag. 171, No. 1 b, pl. IX, fig. 1). Also *A. umbriceps* JORDAN & THOMPSON, has smaller scales than the three specimens from „Michael Sars" 1910. JORDAN & THOMPSON says namely in the text (No. 56 a, pag. 209) "65 pores in lateral line" and their figure, pl. XXIV, fig. 1, shows 71 scales in the lateral line. Moreover the eye is smaller and the interorbital space broader, than the case is in *A. australis* from "M. S.", as the eye goes 4 times into the head after the text (No. 56 a, pag. 209) and 4.6 times after the figure (No. 56 a, pl. XXIV, fig. 1) and the "bony interorbital space 6.5 in head".

### ***Alepocephalus macropterus,*** Vaillant.

Pl. I, fig. 1.

1888. *Alepocephalus macropterus,* Vaillant (No. 86, pag. 150, pl. XI).
1895. *Conocara macroptera,* (Vaillant), Goode & Bean (No. 37, pag. 39, fig. 43).
1896. „ „ (Vaillant), Jordan & Evermann (No. 56 I, pag. 457).
1906 (08). *Alepocephalus macropterus,* (Vaillant), Holt & Byrne (No. 48, pag. 42, pl. V, fig. 1).
1919. *Conocara macroptera,* (Vaillant), Roule (No. 79 c, pag. 5).

5 specimens, 24—27.5 cm., St. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

1 specimen, 20.5 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

2 specimens, 20—21 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

1 specimen, 16 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

D. 18—21, A. 37—39, V. 6—7, P. 8—10.

The proportion height of body to length varies from 6 to 8.10. The caudal peduncle is expanded dorsally and ventrally in a membranous keel supported by rays in the half nearest the true caudal fin. Its height is measured at the lowest part, immediately behind the base of the anal fin. The proportion between height of caudal peduncle and length of head is therefore in the present specimens 1 : 4.22—5.70. The length of the caudal peduncle, from the dorsal fin to the middle of the base of the caudal fin is to the length of head as 1 : 1.73—2.40, and to the length of body as 1 : 6.14—7.65. HOLT and BYRNE (No. 48, pag. 42) give the proportion to the head as 1 : 1.5—2, and VAILLANT that to the length of body as 1 : 7. (No. 86, pl. XI, fig. 2).

The head appears slightly larger than in HOLT and BYRNE's specimens (No. 48, pag. 42), going only from $3^1/_5$ to $3^3/_5$ times into the length of body. As regards the eye and snout, the proportion is here slightly different from what is stated by HOLT and BYRNE. In the "Michael Sars" specimens, the length of the snout is reckoned to the cavity of the eye and by length of the eye we understand the diameter of the entire orbital cavity. (The figure shows the size of the aperture, not of the cavity itself). These measurements, based as they are upon fixed points in the skeletal structure, render it possible to make comparison with other species of *Alepocephalus,* where the skin, as we know, is frequently damaged. Thus the eye is larger than the snout in all the "Michael Sars" specimens, the eye itself going only 2.66—3.08 times into the length of head. The width of the frontalia is thus also considerably less than $^4/_5$ of the eye; here again only the frontal bony bridge between the eyes has been measured, as the eyes may be more or less shrunken so that measurement of the membranous part would be unreliable, while this part is also frequently found damaged in other *Alepocephali.* If, however, we include the membranous part, then the interorbital space can about equal the length of the orbital cavity.

The upper jaw always projects out over the lower, and embraces it. The maxilla reaches barely to the eye, or just under it, but not to the pupil. The præmaxilla is armed with strong teeth. In the fringe of skin which runs as a continuation of the præmaxilla round the posterior part of the maxilla, there are small teeth, more or less distinctly serial. There are also teeth on the palatina, tongue, dentalium of the mandible, with some insignificant dentition in that part of the mandible which meets the præmaxilla.

The anus is situated near the middle of the body, if anything a little in rear. The base of the anal fin is more than double that of the dorsal; it has 37—39 rays. The base of the dorsal fin is less than its distance from the vertical for the middle rays of the caudal fin; its rays vary from 18 to 21. The ventral fins have 6 rays, one 7; they extend past the anus, but their length is yet less than that of the eye. The length of the pectoral fin is about equal to the distance from pupil to point of snout, or in the smallest specimens, from the centre of the eye

to same; they have 8—10 rays. A space of the skin behind the gill-opening and dorsal to the base of pectoral fin is naked just as the head.

The branches of the lateral line on the head have partly very distinct round pores, partly small filiform papillæ.

The pyloric appendages are, in the one specimen from St. 41, divided into two groups: 4 on the right and 3 on the left side of the stomach. This specimen had an amphipod, *Phronima atlantica,* (determined by OSCAR SUND) in the stomach.

| Total length | Length of body | Height of body | Height of caudal peduncle | Length of caudal peduncle | Length of head | Horiz. diam. of eye | Length of snout | Width of frontalia between the eyes | Membranous interorb. space | Snout to anal | Anus to anal | Base of dorsal | Base of anal | Dorsal fin rays | Anal fin rays | Pectoral fin rays | Ventral fin rays | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | |
| abt. 157 | 135 | 19 | 9 | 22 | 38 | 13 | 12 | 6.5 | — | 74 | 9 | 20 | 45 | 21 | 37 | 9 | 7 | 95 |
| 205 | 167 | 21 | 10 | 26 | 50 | 18 | 16 | 8 | 16 | 94 | 7 | 23 | 50 | 19 | 37 | 8 | 6 | 25 |
| 200 | 178 | 22 | 10.5 | 24 | 54 | 18 | 17 | 10 | — | 107 | 6 | 23 | 55 | 19 | 39 | 10 | 6 | 41 |
| abt. 210 | 183.5 | 24 | 10 | 27 | 57 | 19.5 | 18 | 10 | 13 | 108 | 8 | 21 | 56 | 19 | 39 | 9 | 6 | 41 |
| 240 | 210 | 30 | 12 | 30.5 | 63 | 22 | 19 | 10 | 22 | 121.5 | 6 | 28 | 64 | 18 | 37 | 8 | 6 | 24 |
| 265 | 235 | 37 | 14 | 31 | 72 | 24 | 23 | 14 | — | 144 | — | 31 | 66 | 21 | 38 | 8 | 6 | 24 |
| 270 | 240 | 34 | 16 | 33 | 68 | 23 | 21 | 13 | — | 141 | 11 | 33 | 73 | 21 | 37 | 9 | 6 | 24 |
| 270 | 240 | 40 | 14 | 32 | 74 | 24 | 23 | 11.7 | 24 | 150 | 8 | 30 | 69 | 20 | 39 | 9 | 6 | 24 |
| 275 | 245 | 33 | 15 | 32 | 77 | 29 | 22 | 12 | 30 | 155 | 9 | 30 | 69 | 21 | 39 | 10 | 6 | 24 |

| Total length | Length of body | Length of body: Height of body | Length of head: Height of caudal peduncle | Length of head: Length of caudal peduncle | Length of body: Length of caudal peduncle | Length of body: Length of head | Length of head: Horiz. diam of eye | Length of head: Length of snout | Horiz. diam. of eye: Width of frontalia betw. eyes | Station |
|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | |
| abt. 157 | 135 | 7.11 | 4.22 | 1.73 | 6.14 | 3.55 | 2.92 | 3.16 | 2.00 | 95 |
| 205 | 167 | 7.95 | 5.00 | 1.92 | 6.43 | 3.34 | 2.78 | 3.12 | 2.25 | 25 |
| 200 | 178 | 8.10 | 5.14 | 2.25 | 7.43 | 3.30 | 3.00 | 3.18 | 1.80 | 41 |
| abt. 210 | 183.5 | 7.65 | 5.70 | 2.11 | 6.80 | 3.22 | 2.92 | 3.17 | 1.95 | 41 |
| 240 | 210 | 7.00 | 5.25 | 2.06 | 6.89 | 3.34 | 2.86 | 3.32 | 2.20 | 24 |
| 265 | 235 | 6.35 | 5.14 | 2.32 | 7.58 | 3.27 | 3.00 | 3.13 | 1.71 | 24 |
| 270 | 240 | 7.06 | 4.25 | 2.06 | 7.29 | 3.53 | 2.96 | 3.24 | 1.77 | 24 |
| 270 | 240 | 6.00 | 5.28 | 2.31 | 7.50 | 3.24 | 3.08 | 3.22 | 2.05 | 24 |
| 275 | 245 | 7.42 | 5.13 | 2.40 | 7.65 | 3.19 | 2.66 | 3.50 | 2.42 | 24 |

***Alepocephalus murrayi,*** n. sp.

Pl. III, fig. 6.

1 specimen, 29 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

2 specimens, 23—27 cm., St. 35, 18-19/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

D. 19—22, A. 26—27, P. 8—9, V. 5—6, lat. line 60—70.

This *Alepocephalus* resembles in appearance mostly *A. macdonaldi* (No. 37, pag. 39, fig. 48); it has, however, among other points of difference, larger and fewer scales and shorter anal fin.

The height of the body goes from $5^1/_3$ to $5^3/_4$ times into the length; the back is compressed, especially in front of the dorsal fin, forming a dorsal muscular keel although this is only slightly marked. The caudal peduncle in the two smaller specimens is membranous dorsally and

ventrally, and supported there, throughout its major portion, by rays; in the largest specimen these are covered by musculature. The proportion full height of caudal peduncle to height of body is in the specimen of intermediate size, where the membranous part is most pronounced, 2.21, in the largest specimen 2.82. The length of the caudal peduncle goes in the smallest fish hardly $6^1/_2$ times, in the largest one $7^1/_2$ times into the length of body.

The length of the head goes about $2^3/_4$ times into that of the body; the snout about $8^1/_2$—$9^1/_2$ times into this, and 3 to $3^1/_3$ times into the head. On the upper side of the head there are two low ridges commencing on the crown, and arching over the eyes to meet in an acute angle at the point of the snout. Save for these, and for a slight concavity on the crown, the head is flat at the top. The eye is smaller than the snout, and goes from $3^1/_2$ to 4 times into the head.

The upper jaw embraces the lower, and reaches to the anterior margin of the eyeball or of the pupil. The præmaxilla, vomer, palatina and the dentalia of the mandible have well-developed teeth; there are a few insignificant teeth in the skin of the maxilla along the edge.

The width of the frontalia opposite centre of eyes is fairly great, going about 4—$4^1/_2$ times into the length of head, and the crown is only $1^1/_2$ times the width of the frontalia. As frequently found in *Alepocephali,* there is a process behind the eye, one at the top of the præoperculum, and one on the upper fore-corner of the operculum; these are, however, with the exception of that on the operculum, only slightly pronounced. There are 4 slight keels on the operculum. The opercular flap is large. The postorbital part of the head is about half the length of the entire head.

The ventral fins are placed slightly in rear of the middle of the belly, but in the middle of the body when counting the caudal fin. The distance from anal fin to point of snout is about equal to $^2/_3$ the length of body, that to the dorsal about $^3/_4$. The dorsal fin having fewer rays than the anal, its base is somewhat shorter, being about $^3/_4$ that of the anal fin, and in the case of the large specimen even less. In the small specimen, the ventral fins just reach to the anus; in the two larger ones, they do not reach so far. The pectoral fins are about as long as the snout.

There are about 85 ordinary scales from the upper posterior corner of the gill-cover to the caudal fin. The number of scales in the lateral line is estimated at between 60 and 70, counting to the base of the caudal fin; it is difficult to count these in the forepart of the body partly on account of a fold which has developed in course of preservation, while in the caudal peduncle, the lateral line cannot be traced on the scales. The forepart of the scales in the lateral line (fig. 9) is like that of the other scales, in the posterior portion, however, the centre is occupied by the channel of the lateral line, which begins on the upper side of the scale and goes out through the lower;

Fig. 9. *Alepocephalus murrayi,* n. sp., 29 cm. One of the last scales in the lateral line (× 19.5).

the free margin of the scale is here concave, and only the edge with the pore of the lateral line is free, the remaining portion of the rear part of the scale being covered by the scales above and below. Such scales are found only as far as the 5th row behind the anal fin, and are lacking on the caudal peduncle beyond this. The remaining scales of the body are oval, with excentric striation (fig. 10).

Fig. 10. *Alepocephalus murrayi,* n. sp., 29 cm. Scale from the caudal peduncle (× 19).

From the junction of the striation, which is situate in front of the anterior focal point of the oval, there is a part with close striation extending to the posterior edge of the scale; outside this, in the upper and lower edge of the scale, and in front of the junction, the striation is more open. The head is bare, as also the part behind the opercular flap above the base of the pectoral fin, obliquely from the gill-opening to the pectoral fin, where the skin forms a thin membrane, free at the hindmargin.

| | mm. | mm. | mm. |
|---|---|---|---|
| Total length | abt. 230 | abt.270 | 285 |
| Length of body | abt. 206 | 242 | 255 |
| Height of body | 38 | 42 | 48 |
| Height of caudal peduncle | 15.5 | 19 | 17 |
| Length of caudal peduncle | 32 | 33 | 34 |
| Length of head | 74 | 89 | 91 |

| | mm. | mm. | mm. |
|---|---|---|---|
| Length of snout | 24 | 30 | 27 |
| Horiz. diam. of eye | 20 | 22 | 24 |
| Width of frontalia between eyes | 18 | 20 | 20 |
| Breadth of the crown | 27 | 32 | 30 |
| Length of postorb. part of head | 37 | 46 | 40 |
| Snout to ventral | 111 | 137 | 141 |
| Snout to anus | 127 | 156 | 165 |
| Snout to anal | 141 | 165 | 184 |
| Snout to dorsal | 150 | 178 | 197 |
| Base of dorsal | 29 | 34 | 29 |
| Base of anal | 40 | 43 | 43 |
| Dorsal fin rays | 19 | 22 | 20 |
| Anal fin rays | 26 | 27 | 26 |
| Pectoral fin rays | 8 | 9 | 8 |
| Ventral fin rays | 5 | 6 | 6 |
| Length of body: Height of body | 5.57 | 5.76 | 5.31 |
| Height of body: Height of caudal peduncle | 2.45 | 2.21 | 2.82 |
| Length of body: Length of caudal peduncle | 6.44 | 7.34 | 7.50 |
| Length of body: Length of head | 2.78 | 2.72 | 2.81 |
| Length of body: Length of snout | 8.59 | 8.07 | 9.45 |
| Length of head: Length of snout | 3.08 | 2.96 | 3.37 |
| Length of head: Horiz. diam. of eye | 3.70 | 4.05 | 3.50 |
| Length of head: Width of frontalia | 4.11 | 4.45 | 4.55 |
| Breadth of crown: Width of frontalia | 1.50 | 1.60 | 1.50 |
| Length of head: Breadth of crown | 2.74 | 2.78 | 3.03 |
| Length of body: Snout to ventral | 1.86 | 1.77 | 1.81 |

***Alepocephalus hjorti,*** n. sp.

Pl. III, fig. 7.

1 specimen, 24 cm., St. 53, 8-9/6, N. 34° 59′, W. 33° 1′, 2615—2865 m., yellow hard clayish mud; caught in net, 3 m. diam., with 2600 m. wire out.

D. 19, A. 20, P. 18, V. 6, lat. line 49, tr. at anus $^{16}/_{18}$.

The greatest height of the body is at the pectoral fin, descreasing only slightly towards the dorsal and anal fins; not until the commencement of these, however, do the dorsal and ventral contours commence to slope sharply towards the middle. The height of the caudal peduncle is about $^1/_3$ the height of the body. Back and belly are rounded; only at the base of the median fins they are somewhat sharply compressed. The profile of the head forms a gradually flattened curve above and below.

The proportions are otherwise as follows. Height of body goes about $4^1/_2$ times into the length, that of the caudal peduncle $7^3/_4$ times. The proportion between height of caudal peduncle and length is $2^1/_4$. Reckoning with the opercular membrane behind the operculum, the head goes only $2^1/_5$ times into the body; without the membrane, however, the length of head goes 3 times into that of the body. The eye is small, and sligthly oval; its length goes about $6^4/_5$ times into the full length of the head, its height goes about $1^3/_4$ times into its length. The snout is longer; the proportion between this and the length of head is as 1 : 4.84. The maxilla extends back to the posterior margin of the eye; it is somewhat narrow, with small teeth in the skin. It is impossible to see whether the præmaxilla has been armed with teeth or not, as its forepart is destroyed; nor can it be distinctly seen how far back it extends. Professor JUNGERSEN pointed out, in conversation, that the præmaxilla in several *Alepocephalidæ* probably extends out along the maxilla, and that this should be investigated in the skeleton; this species is apparently one of those in which this is the case. There are small teeth in the mandible.

There is a slight keel on the tongue; over the basibranchialia runs a distinct median keel, and towards this in an acute angle two ridges; these are the first branchial arches; at the sides of these, long smooth papillæ extend into the mouth. The palate has low parallel longitudinal ridges with small papillæ; behind these are seen the long papillæ on the upper portions of the branchial arch, and behind them again the longitudinally folded gullet.

The head is on the whole broad; the breadth of the snout corresponds approximately to the length of the eye; the width of the frontalia is $^1/_5$ the length of the head; the full interorbital space between the eyes $^1/_4$, and the breadth of the crown barely $^1/_3$ the length of the head. As usual, there is a bony process before and behind the crown, and on the operculum, from which ridges extend.

The pectoral fin is largely covered by the opercular flap. The ventral fins lie behind the centre of the body,

Fig. 11. *Alepocephalus hjorti,* n. sp., 24 cm. Scale (× 10).

slightly in front of the third fifth; they reach past the anus. The anus is midway between the ventral fins and the anal. Behind the anus there is a small papilla. The dorsal and anal fins both commence hardly $^1/_3$ the length of the body from the caudal fin; their bases are as nearly as possible equal. The lateral line runs in a curve up to the neck and has 49 scales. From the anus to the lateral line there are 18 alternating rows of scales; over the lateral line at the same level 16. The scales are markedly oblong, the striation excentric, and closest at the edge, more open in the centre (fig. 11).

| | mm. |
|---|---|
| Total length | 240 |
| Length of body | 202 |
| Height of body | 44 |
| „ of caudal peduncle | 15 |
| Length of caudal peduncle | 26 |
| Anal to base of caudal | 26 |
| Length of head | 92 |
| „ of head without opercular flap | 67.5 |
| „ of snout | 19 |
| Horiz. diam. of eye | 13.5 |
| Vert. diam. of eye | 11.5 |
| Length of postorb. part of head | 60 |
| Width of frontalia opposite centre of eyes | 18.5 |
| Distance between eyes. (Interorbital space) | 23 |
| Breadth of the crown | 28 |
| Snout to ventral | 115 |
| Ventral to base of caudal | 88.5 |
| Snout to anus | 129 |
| „ to anal | 145 |
| „ to dorsal | 144 |
| Base of dorsal | 38 |
| Base of anal | 37 |
| Origin of anal to base of caudal | 64 |
| Length of body: Height of body | 4.59 |
| „ „ : Length of caudal peduncle | 7.77 |
| Length of caudal peduncle: Height of caudal peduncle | 2.26 |
| „ of body: Length of head | 2.20 |
| „ of body: Length of head without opercular flap | 3.02 |
| „ of head: Horiz. diam. of eye | 6.81 |
| Horiz. diam. of eye: Vert. diam. of eye | 1.72 |
| Length of head: Length of snout | 4.84 |
| —„— : Width of frontalia between eyes | 4.97 |
| —„— : Distance between eyes. (Interorb. space) | 4.00 |
| —„— : Breadth of the crown | 3.28 |
| Length of body: Origin of anal to base of caudal | 3.16 |

***Alepocephalus macrolepis,*** n. sp.

Pl. III, fig. 8.

1 specimen, 20 cm., St. 48, 31/5, N. 28° 54′, W. 24° 14′; net ½ m. diameter, 7550 m. wire out.

D. 23, A. 28, P. 10, V. 6, lat. line 44, tr. 12.

The shape of the body is remarkably elegant for an Alepocephalid. The head is broad and blunt, with steep, slightly pointed snout, resembling the porpoise in shape. The body is compressed, especially the tail behind the anus. The belly is sharp, the back round, having, however, a slight keel formed by the scales of the sides standing up convergently at the edge of the back. The caudal peduncle is low, and compressed, with the caudal fin large and fanshaped. Judging from this shape of its body, the fish should be a good swimmer; nevertheless it was surprised by the small silk net, of ½ m. diameter.

The greatest height of the body is just over the pectoral fin, and goes 4½ times into the total length. The height of the caudal peduncle is equal to about half its own length, and goes 4⅓ times into the height of the body. The length of the head with opercular flap goes 2¾ times into the length of body; taking the head only to the posterior margin of the operculum, however, 3¼ times. From the neck, the head slopes gradually down over the eye; the snout makes a convex curve in front of the eye, and goes down sharply to the præmaxilla, which projects in a small point. The middle of the snout is convex, forming a rounded keel. The snout is less than the eye; its proportion to the length of the latter is 1.11; to the length of body 12.97. The length of the eye is to the head as 1 : 4.26. The eye is slightly oval, however, the proportion between its vertical and horizontal diameter is 1.07, but the pupil is oblong horizontally, rendering the eye still more oval in appearance. After preservation, the vertical diameter of the pupil to the horizontal is as 1 : 1.5. The præmaxilla and maxilla embrace the mandible; the præmaxilla extends inside the maxilla almost to its rear end. The maxilla reaches to the posterior margin of the eye; it is slightly broader at the back, but not greatly so. The point of the mandible is rounded, not projecting.

The forepart of the præmaxilla and of the mandible have teeth; on the præmaxilla they are fairly strong, but on the mandible quite small and closely set. The tongue, branchial arch and palate are similar in appearance to those of *A. hjorti.*

The interorbital space is fairly great; the crown short and broad. Behind the eye and at the posterior corner of the crown there is a small osseous process; the distance between them is only 6 mm., whereas the breadth of the crown is 22⅓ mm. From the neck, two low ridges run out over the eye, enclosing a slightly concave, lyre-shaped space, broadest at the back. Along these two ridges a row of large pores runs out to the point of the snout; another row of pores goes out beneath the eye, and a third follows the præoperculum, extending out over the mandible. As usual in the *Alepocephalidæ*, there is a bony process in the upper fore-corner of the operculum, with keels extending outwards; only the one bounding the lower portion of the operculum, however, is prominent.

The pectoral fins are half hidden under the opercular flap. The ventral fins are placed about midway between the point of the snout and the caudal fin. The anal fin is a little in front of the last third of the body; the dorsal fin commences above the 8th ray of the anal fin, but terminates at the same distance from the caudal fin as the anal. The anus is slightly in front of the anal fin; behind the anus there is a small papilla.

The sides are striped longitudinally, this appearance being caused by the fact that the scales have a longitu-

dinal groove, and the scales in one longitudinal row overlap those above and beneath save only for their central portion, so that the furrowed central part lies slightly lower than the upper and lower, giving the side of the

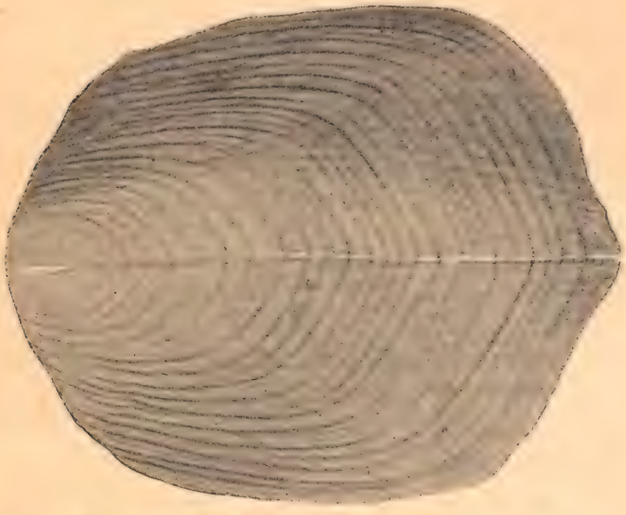


Fig. 12. *Alepocephalus macrolepis*, n. sp., 20 cm. Scale (× 10).

body a slight longitudinal groove for each row of scales. The lateral line is therefore difficult to distinguish; it runs from the neck to the caudal peduncle, along a row of scales which are slightly concave or rounded at their posterior end, whereas the other scales terminate more in a point.

The scales on the side are large, 5—7 mm. long and 4—5 mm. high; they are hexagonal in shape (fig. 12).

Fig. 13. *Alepocephalus macrolepis*, n. sp., 20 cm. Scale from lateral line (× 10).

Parallel with the upper and lower edge, and with the two posterior edges, run about 15—19 belts of thicker and thinner parts, this is most distinctly seen near the edge. In addition, the scales have, as already mentioned, a narrow longitudinal groove along the middle; in the scales of the lateral line this increases in breadth towards the posterior point of the scale (fig. 13). The scales have a very close excentric striation; at the two fore-edges the striation is more open and irregular than in the remaining portions of the scales. The junction of the striation lies very near the foremost point of the scale. Along the groove in the median line of the scale the striation is broken, and in the scales of the lateral line a break also occurs, along the upper and lower edge of the broader groove.

| | mm. |
|---|---|
| Total length | 200 |
| Length of body | 175 |
| Height of body | 39 |
| Height of caudal peduncle | 9 |
| Dorsal to base of caudal | 17.5 |
| Anal to base of caudal | 17 |
| Length of head | 64 |
| „ of head without opercular flap | 54 |
| „ of the snout | 13.5 |
| Horiz. diam. of eye | 15 |
| Vertical diam. of eye | 14 |
| Horiz. diam. of right pupil | 9 |
| Vertical diam. of right pupil | 6 |
| Horiz. diam. of left pupil | 8.5 |
| Vertical diam. of left pupil | 5.5 |
| Length of postorbital part of head | 38 |
| Width of frontalia opposite centre of eyes | abt. 9 |
| Distance between eyes. (Interorbital space) | 13 |
| Breadth of the crown | 22.5 |
| Snout to ventral | 87 |
| Ventral to caudal | 90 |
| Snout to anal | 112 |
| Base of dorsal | 33 |
| Base of anal | 45 |

| | |
|---|---|
| Length of body: Height of body | 4.49 |
| Height of body: Height of caudal peduncle | 4.34 |
| Length of body: Length of head | 2.74 |
| „ of body: Length of head without opercular flap | 3.24 |
| Horiz. diam. of eye: Length of snout | 1.11 |
| Length of body: Length of snout | 12.97 |
| „ of head: Horiz. diam. of eye | 4.26 |
| Horiz. diam. of eye: Vertical diam. of eye | 1.07 |
| „ „ of right pupil: Vertical diam. of right pupil | 1.50 |
| „ „ of left pupil: Vertical diam. of left pupil | 1.55 |

***Bathytroctes alvifrons,*** Garman.

1899. *Bathytroctes alvifrons*, Garman (No. 26, pag. 286, pl. LVIII, figs. 2, 2 a).

19 specimens, 11—40 cm., St. 53, 9/6, N. 34° 59′, W. 33° 1′, 2865 m., yellow hard clayish mud.

D. 14—16, A. 10—13, V. 7—9, P. 10—13, lat. line about 40—43.

The greatest height of the body is at the neck from 5 to $6^1/_5$ the length of the body; from here it decreases

| Total length | Length of body | Height of body at pectoral fin | Height of caudal peduncle | Dorsal to caudal fin | Anal to caudal fin | Length of head | Length of snout | Horizontal diam. of eye | Vertical diam. of eye | Distance between præfrontal and postfrontal process | Width of frontalia opposite centre of eyes | Interorbital space | Width of head between postfrontal & squamosum | Postorbital part of head | Distance between head and anus | Anus to caudal fin | Snout to ventral fin | Snout to dorsal fin | Snout to anal fin | Length of dorsal fin basis | Length of anal fin basis | Dorsal fin rays | Anal fin rays | Ventral fin rays | Pectoral fin rays | Lat. line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| abt. 105 | abt. 92 | 17 | 9 | 20 | abt. 13 | 36 | 10 | 10 | 8 | — | 5 | — | 14 | 16 | abt. 29 | abt. 29 | 56.5 | 59 | — | — | — | 15 | 11 | 8 | — | — |
| above 110 | 100 | 18 | 10 | 20 | 17 | 35 | 9 | 10.5 | 8 | — | abt. 6 | — | 13 | 15 | 34 | 34 | 60 | 65 | — | — | — | 16 | 11 | 8 | 11 | — |
| abt. 125 | 104 | 18 | 9.2 | 21.5 | 17 | 38 | 10 | 11.2 | 9 | 12 | 5 | abt. 7.5 | 14.8 | 19 | 31 | 34 | 65 | 70 | 78.5 | 12 | 9 | 13 | 11 | 7 | abt. 11 | — |
| 120—130 | „ 106 | 18 | 9.5 | 22 | 17 | 48 | 11.2 | 11.1 | 8 | — | 6 | — | 14 | 18.5 | 35 | 33.7 | 66 | 72.5 | — | — | — | 15 | 11 | 8 | 10 | — |
| abt. 130 | „ 110 | 20 | 11 | 22.8 | 16.5 | 39 | 10 | 11 | 9 | — | 6 | — | 15 | 18.5 | 39 | 35 | 71.5 | 73 | — | — | — | 15 | 12 | 9 | 12 | — |
| „ 125 | „ 110 | 19 | 12 | 22.2 | 15 | 40 | 11 | 11.8 | 9 | — | 6 | — | 15 | 18 | „ 35 | „ 35 | 68 | 72 | — | — | — | 14 | 12 | 9 | 12 | — |
| above 130 | 114 | 20 | 11 | 23 | 18 | 40 | 11 | 12.7 | 9 | — | 5.5 | — | 16.5 | 18 | 36 | 36 | 72 | 76 | — | — | — | 14 | 10 | 8 | 11 | — |
| abt. 140 | „ 118 | 20 | 12 | 22 | 16 | abt. 42.5 | abt. 11 | abt. 14 | abt. 10.5 | — | 8 | — | 17 | 21 | 41 | 35 | 75 | 81 | — | — | — | 16 | 12 | 8 | „ 12 | — |
| „ 160 | „ 138 | 22 | 12 | 27 | 21 | 47.5 | 14 | 14 | 11 | — | 8 | — | 19 | 23 | 47 | 45 | 86 | 91 | — | — | — | 16 | 12 | 8 | „ 12 | — |
| „ 170 | 147 | 27.5 | 15 | 25 | 19 | 56 | 15 | 17 | 13 | — | 8 | 11.5 | 21 | 25 | 46.5 | 48.5 | 93 | 99 | 112 | 21 | 16 | 16 | 13 | 8 | 11 | — |
| „ 230 | „ 197 | 35 | 18.5 | 34 | 25 | „ 76 | 21 | 22 | 17 | — | 11 | 14 | 31 | 37 | „ 62 | 58 | 126 | 135 | 150 | 27 | 21 | 15 | 11 | 8 | 12 | abt. 40? |
| „ 250 | 217 | 39 | 18 | abt. 43 | 29.5 | 82 | 22.5 | 24 | 18 | — | 13 | „ 15 | 30.5 | 38 | „ 65 | 71 | 134 | 144 | 160 | 31 | abt. 24 | 14 | 12 | 7 | 13 | — |
| „ 260 | 228 | 45 | 20.5 | 47 | 32.5 | „ 80 | 23 | 23 | 16 | 23 | 11 | „ 18 | 31 | 38 | 77 | 72 | 145 | 151 | — | — | — | 15 | 12 | 7 | 10 | „ 40? |
| „ 280 | 242 | 47 | 24 | 49 | 36 | 85 | 25 | 25 | 19.5 | 24 | 13 | 21 | 35 | 40 | 76 | 76 | 150 | 162 | — | — | — | 16 | 12 | 7 | 10 | „ 40? |
| „ 300 | „ 255 | 41 | 23 | 53 | 39 | 86 | 24 | 25 | 19 | — | 15.5 | — | 35 | 43 | 84 | 80 | 158 | 170 | — | — | — | 15 | 10 | 8 | — | — |
| „ 320 | „ 277 | 52 | 31 | 55 | 43 | 100 | 27 | 27 | 22 | 27 | 15 | 24 | 38 | 52 | 90 | 90 | 175 | 190 | — | — | — | 15 | 12 | 7 | 11 | „ 40 |
| „ 340 | 290 | 57.5 | 29 | 59 | 46 | 100 | 27 | 29.5 | 24.5 | — | 16 | 22 | 41 | 48 | 100 | 93 | 176 | 199 | — | — | — | 15 | 11 | 8 | 11 | „ 40 |
| „ 330 | „ 293 | 54 | 29 | 63 | 48 | „ 97 | 27 | 27 | 21 | — | 16 | 21 | 42 | 46 | abt. 102 | abt. 92 | 185 | 196 | — | — | — | 15 | 12 | 8 | — | „ 40? |
| „ 370 | 318 | 63.2 | 32 | 65 | 45 | 115 | 31 | 30 | 25 | — | 20 | „ 31 | 44 | 62 | abt. 104 | abt. 108 | 197 | 207 | — | — | — | 16 | 12 | 8 | — | „ 43 |
| „ 400 | 350 | 66 | 31 | 72 | 47 | 115 | 31 | 33 | 23 | 31.2 | 17 | „ 28 | 45 | 61 | 114 | 111 | 216 | 227 | — | — | — | 15 | 11 | 8 | — | — |

| Total length | Length of body | Length of body: Height of body | Length of head: Height of body | Height of body: Height of caudal peduncle | Length of body: Dorsal to caudal fin | Dorsal to caudal fin: Height of caudal peduncle | Length of head: Dorsal to caudal fin | Anal to caudal fin: Height of caudal peduncle | Length of head: Anal to caudal fin | Length of body: Length of head | Length of head: Length of snout | Length of head: Horizont. diam. of eye | Horizont. diam. of eye: Length of snout | Horizont. diam. of eye: Vertical diam. of eye | Width of head between postfrontal & squamosum: Width of frontalia | Length of head: Length of postorbital part of head | Length of body: Snout to ventral fin | Snout to dorsal fin: Length of head |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | |
| abt. 105 | abt. 92 | 5.41 | 2.12 | 1.89 | 4.60 | 2.22 | 1.80 | 1.44 | 2.76 | 2.56 | 3.60 | 3.60 | 1.00 | 1.31 | 2.80 | 2.25 | 1.63 | 1.64 |
| above 110 | 100 | 5.55 | 1.94 | 1.80 | 5.00 | 2.00 | 1.75 | 1.70 | 2.06 | 2.86 | 3.89 | 3.33 | 1.17 | 1.31 | 2.17 | 2.33 | 1.67 | 1.86 |
| abt. 125 | 104 | 5.78 | 2.11 | 1.96 | 4.34 | 2.34 | 1.77 | 1.85 | 2.24 | 2.74 | 3.80 | 3.39 | 1.12 | 1.25 | 2.96 | 2.00 | 1.60 | 1.84 |
| 120—130 | „ 106 | 5.89 | 2.66 | 1.90 | 4.82 | 2.32 | 2.18 | 1.79 | 2.82 | 2.21 | 4.28 | 4.32 | 0.99 | 1.39 | 2.34 | 2.60 | 1.61 | 1.51 |
| abt. 130 | „ 110 | 5.50 | 1.95 | 1.82 | 4.83 | 2.07 | 1.71 | 1.50 | 2.36 | 2.82 | 3.90 | 3.54 | 1.10 | 1.22 | 2.50 | 2.11 | 1.54 | 1.87 |
| „ 125 | „ 110 | 5.80 | 2.10 | 1.58 | 4.96 | 1.85 | 1.80 | 1.25 | 2.66 | 2.75 | 3.64 | 3.39 | 1.07 | 1.31 | 2.50 | 2.22 | 1.62 | 1.80 |
| above 130 | 114 | 5.70 | 2.00 | 1.82 | 4.96 | 2.09 | 1.74 | 1.64 | 2.22 | 2.85 | 3.64 | 3.14 | 1.15 | 1.41 | 3.00 | 2.36 | 1.58 | 1.90 |
| abt. 140 | „ 118 | 5.90 | 2.12 | 1.67 | 5.37 | 1.83 | 1.93 | 1.33 | 2.66 | 2.78 | 3.86 | 3.04 | 1.27 | 1.33 | 2.12 | 2.02 | 1.57 | 1.91 |
| „ 160 | „ 138 | 6.28 | 2.28 | 1.83 | 5.11 | 2.25 | 1.76 | 1.75 | 2.26 | 2.76 | 3.57 | 3.57 | 1.00 | 1.27 | 2.38 | 2.06 | 1.60 | 1.92 |
| „ 170 | 147 | 5.35 | 2.04 | 1.83 | 5.88 | 1.67 | 2.24 | 1.27 | 2.95 | 2.62 | 3.74 | 3.30 | 1.13 | 1.31 | 2.62 | 2.24 | 1.58 | 1.77 |
| „ 230 | „ 197 | 5.63 | 2.17 | 1.95 | 5.80 | 1.84 | 2.24 | 1.35 | 3.04 | 2.60 | 3.62 | 3.45 | 1.05 | 1.29 | 2.82 | 2.05 | 1.56 | 1.78 |
| „ 250 | 217 | 5.57 | 2.10 | 2.06 | 5.05 | 2.39 | 1.91 | 1.64 | 2.78 | 2.64 | 3.64 | 3.42 | 1.07 | 1.33 | 2.34 | 2.16 | 1.62 | 1.76 |
| „ 260 | 228 | 5.07 | 1.78 | 2.20 | 4.75 | 2.30 | 1.70 | 1.59 | 2.46 | 2.85 | 3.48 | 3.48 | 1.00 | 1.44 | 2.82 | 2.10 | 1.57 | 1.89 |
| „ 280 | 242 | 5.15 | 1.81 | 1.96 | 4.94 | 2.04 | 1.73 | 1.50 | 2.36 | 2.84 | 3.40 | 3.40 | 1.00 | 1.28 | 2.69 | 2.12 | 1.61 | 1.91 |
| „ 300 | „ 255 | 6.22 | 2.10 | 1.78 | 4.82 | 2.30 | 1.62 | 1.70 | 2.20 | 2.97 | 3.58 | 3.44 | 1.04 | 1.32 | 2.22 | 2.00 | 1.61 | 1.98 |
| „ 320 | „ 277 | 5.35 | 1.92 | 1.68 | 5.04 | 1.77 | 1.82 | 1.39 | 2.33 | 2.77 | 3.70 | 3.70 | 1.00 | 1.23 | 2.54 | 1.92 | 1.58 | 1.90 |
| „ 340 | 290 | 5.05 | 1.74 | 1.98 | 4.92 | 2.04 | 1.70 | 1.59 | 2.17 | 2.90 | 3.71 | 3.39 | 1.09 | 1.20 | 2.66 | 2.08 | 1.65 | 1.99 |
| „ 330 | „ 293 | 5.43 | 1.80 | 1.86 | 4.65 | 2.17 | 1.54 | 1.66 | 2.02 | 3.02 | 3.59 | 3.59 | 1.00 | 1.28 | 2.66 | 2.11 | 1.58 | 2.02 |
| „ 370 | 318 | 5.02 | 1.82 | 1.98 | 4.40 | 2.03 | 1.77 | 1.41 | 2.56 | 2.76 | 3.72 | 3.84 | 0.97 | 1.20 | 2.20 | 1.86 | 1.61 | 1.80 |
| „ 400 | 350 | 5.30 | 1.74 | 2.12 | 4.87 | 2.32 | 1.60 | 1.52 | 2.45 | 3.04 | 3.71 | 3.49 | 1.06 | 1.43 | 2.64 | 1.89 | 1.62 | 1.97 |

gradually down to the caudal fin; not more so, however, than that the height at the caudal peduncle goes from $1^{8}/_{5}$ to $2^{1}/_{5}$ times into the height of body at the pectoral fin. In the small specimens, a membrane extends dorsally and ventrally along the caudal peduncle, in the larger fish this is not distinctly marked. The length of the caudal peduncle is about $^{1}/_{5}$ that of the body; the proportion varying, however, from 4.34 to 5.88. The caudal peduncle reckoned from the posterior ray of the dorsal fin to the middle of the base of the caudal fin, is about twice as long as it is high, the proportion between height and length varying between $1^{2}/_{3}$ and $2^{1}/_{3}$. The proportion between distance from anal fin to caudal fin and height of caudal peduncle, however, is between $1^{1}/_{4}$ and $1^{9}/_{10}$. This distance between anal and caudal fins goes from 2 to 3 times into the length of head. Between the neck and the dorsal fin there is a slightly marked muscular fold.

The head is fairly pointed, its upper profile is gradual; from the neck to the anterior margin of the eye an almost straight, faintly sloping line; over the anterior margin of the eye a convex curve; the upper contour of the snout is straight, and forms an angle with the mandible of 50° in large specimens, about 40° in the smaller. The length of the head goes from $2^{1}/_{5}$ to 3 times into that of the body, the snout from $3^{2}/_{5}$ to about $4^{1}/_{4}$ times into length of head, and the horizontal diameter of the eye from

3 to 4 1/3 times into the same. The length of the eye is as a rule equal to or greater than that of the snout; only in two cases it was less. The eye is slightly oval; its vertical diameter is to the horizontal as 1 : 1.20—1.44. In front of the ethmoideum project the præmaxillæ, which meet in a point. The præmaxilla is bordered with a fringe of small crescent-shaped plates, standing out horizontally, and running up into a small point in the centre; these are continued on the maxilla. The præmaxilla and maxilla form a straight edge to the mouth, entirely embracing the mandible. The maxilla occupies slightly less than half the edge of the mouth, the proportion between the share of the maxilla and that of the præmaxilla in the entire upper jaw being as 1 : 1.11—1.18.

The maxilla is very broad; it reaches to the posterior margin of the pupil or of the iris. Præmaxilla and maxilla have each a row of powerful teeth. The mandible has a projecting chin; this, as well as the palatina and vomer armed with a series of fairly powerful teeth. The tongue is armed with quite small teeth; it is of no great size, and the branchial arches with their spiny papillæ extend far out into the mouth. The frontal part above the eyes is slightly concave, between the supporting lamellæ of the supraorbital branches in the lateral line. These are here almost parallel, but converge more and more from the neck towards the point of snout. The crown is broad; the proportion between the interorbital bony bridge and the breadth of the crown is as 1 : 2—3; the lateral corners of the crown, postfrontal and the squamosum, are slightly projecting. As usual, there is also a projecting process on the operculum, from which raised bony keels extend out into the operculum. The postorbital portion of the head goes between 1 4/5 and 2 2/5 times into the entire length of head.

The anus is situate midway between the head and the caudal fin, or, more exactly, midway between the posterior margin of the opercular flap and the middle of the base of the caudal fin. More or less close in front of the anus are the ventral fins, which are set slightly in front of the commencement of the last third of the body. They reach to the anal fin. The dorsal fin commences over the anus, or slightly farther forward, its distance from the point of the snout is 1 1/2 times to twice the length of the head; it terminates above the anterior half, or over the middle, of the anal fin, reaching, however, in one or two cases past the middle. The anal fin may commence under the middle of the dorsal, or as far back as its last ray; the base is shorter than that of the dorsal.

The specimen measuring 197 mm. body has 7 short thick pyloric appendages, 5 on the right, 2 on the left side of the thick-walled stomach.

***Bathytroctes michaelsarsi,*** n. sp.

Pl. III, fig. 9.

4 specimens, abt. 26—42 cm., St. 53, 9/6, N. 34° 59', W. 33° 1', 2865 m., yellow hard clayish mud.

D. 15—16, A. 11—12, V. 8—9, P. 16, lat. line abt. 45—50.

This species is very closely related to *B. alvifrons,* but is distinguished by its greater height of body and the slenderer caudal peduncle. It also lacks the crescent-shaped plates along the maxilla, and the eye is almost circular.

The greatest height of the body at the neck goes from 4 1/5 to 4 9/10 times into the length, and is about 2/3 the length of the head. In *alvifrons,* on the other hand, the height of the body is only about half the length of the head. The height of the caudal peduncle goes about 2 1/2—2 3/4 times into that of the body; the proportion between height and length of the caudal peduncle is as 1 : 2 3/5. The length of the caudal peduncle is to the length of body as 1 : 4 1/3—4 3/4, and to the length of head as 1 : 1 1/3—1 3/5.

The belly is compressed, the back, however, round, and the muscular fold between the neck and dorsal fin is either not perceptible at all or only very slightly so.

The upper profile of the head is perfectly straight, without curvature over the eye. The length of the head goes about 3—3 1/4 times into the length of body, and is thus on the whole shorter than in *alvifrons.* The snout goes from 3 1/8 to 3 7/10, and the eye from 3 1/2 to 4 1/5 times into the length of the head; the length of the eye is thus in the one specimen equal to that of the snout; in the three others less. The proportion between the vertical and horizontal diameter of the eye is as 1 : 1.05—1.16; the eye is thus not far from circular; the pupil, however, is horizontally oval. The snout is broad in front, concave at the sides, between the point of snout and the eye. The præmaxilla is rounded in front, and forms a flat lip in front of the ethmoideum. On the præmaxilla there are small triangular plates standing out horizontally, corresponding to the crescent-shaped ones in *alvifrons;* on the maxilla, however, there are none. The border of the mouth makes a curve down at the transition from maxilla to præmaxilla. The maxilla makes up a greater part of the edge of the mouth than in *alvifrons,* the proportion between præmaxilla's and maxilla's share being approximately as 1 : 1.2—1.4. The maxilla reaches to the posterior margin of the iris. It attains its greatest breadth at the fore-edge of the eye, and continues thence with equal breadth under the eye; it is cut off more or less straight behind. In *alvifrons,* on the other hand, the maxilla broadens gently, reaching its maximal breadth in

the posterior portion, under the centre of the eye; this difference is, however, not pronounced in all specimens. The mandible has a projecting chin; the præmaxilla lies over this, but does not embrace it. The jaws, vomer and palatina are armed with a row of small teeth; in addition, there are 5 widely set teeth outside the actual series in each præmaxilla. The short tongue itself has no teeth, there are, however, teeth along the root of the tongue and in the rows of papillæ on the branchial arches, which project beyond the angle of the lower jaw. The palate is folded, and has small papillæ. The branches of the lateral line on the head are very distinct, with

| Total length | Length of body | Height of body | Height of caudal peduncle | Dorsal to caudal fin | Anal to caudal fin | Length of head | Length of snout | Horizontal diam. of eye | Vertical diam. of eye | Distance between præfrontal and postfrontal process | Width of frontalia opposite centre of eyes | Width of interobital space | Width of head between postfrontal and squamosum | Length of postorbital part of head |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm. | | | | | | | | | | | | | |
| abt. 26 cm. | 230 | 49 | 19 | 49 | 34 | 77 | 22 | 22 | 19 | 20.5 | 9.8 | 13 | 28 | 34 |
| „ 27 „ | abt. 245 | 49 | 20 | 55 | 40 | 78 | 21.2 | 20.5 | 19 | 19.9 | 8.5 | 15 | 30 | 38 |
| „ 300 mm. | 270 | 55 | 22 | 62.5 | 46.5 | 83 | 23 | 22 | 21 | 21.8 | 9.5 | 15 | 30 | 40 |
| „ 42 cm. | 377 | 80 | 28 | 83 | 63 | 118 | 33 | 28 | 26 | 26 | 14 5 | 22 | 38 | 60 |

| Total length | Length of body | Distance between head and anus | Anus to caudal fin | Snout to anus | Ventral fin to anus | Anus to anal fin | Snout to ventral fin | Snout to dorsal fin | Base of dorsal fin | Base of anal fin | Dorsal fin rays | Anal fin rays | Ventral fin rays | Pectoral fin rays |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm. | | | | | | | | | | | | | |
| abt. 26 cm. | 230 | 85 | 70 | 157 | 20 | 16 | 139 | 148 | 36 | 24 | 15 | 11 | 8 | 16 |
| „ 27 „ | abt. 245 | 84 | 81 | 158 | — | — | 146 | 149 | — | — | 15 | 12 | 8 | — |
| „ 300 mm. | „ 270 | 98 | 92 | 177 | — | — | 158 | 165 | 47 | 34 | 16 | 11 | 8 | 16 |
| „ 42 cm. | „ 377 | 144 | 115 | 259 | — | — | 222 | 241 | — | — | 15 | 11 | 9 | — |

| Total length | Length of body | Length of body: Height of body | Length of head: Height of body | Height of body: Height of caudal peduncle | Length of body: Dorsal to caudal fin | Dorsal to caudal fin: Height of caudal peduncle | Length of head: Dorsal to caudal fin | Anal to caudal fin: Height of caudal peduncle | Length of head: Anal to caudal fin | Length of body: Length of head | Length of head: Length of snout | Length of head: Horizont. diam. of eye | Horizont. diam. of eye: Length of snout | Horizont. diam. of eye: Vertical diam. of eye | Length of head: Width of frontalia opposite centre of eyes | Length of head: Width of interorbital space | Length of head: Width of head between postfrontal and squamosum | Length of head: Length of postorbital part of head | Length of body: Snout to ventral fin | Snout to dorsal fin: Length of head |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| abt. 26 cm. | 230 | 4.70 | 1.57 | 2.55 | 4.70 | 2.58 | 1.57 | 1.79 | 2.26 | 2.99 | 3.50 | 3.50 | 1.00 | 1.16 | 7.87 | 5.92 | 2.75 | 2.26 | 1.65 | 1.92 |
| „ 27 „ | 245 | 4.54 | 1.59 | 2.45 | 4.45 | 2.74 | 1.42 | 2.00 | 1.95 | 3.14 | 3.68 | 3.81 | 0.97 | 1.08 | 9.17 | 5.20 | 2.60 | 2.05 | 1.68 | 1.91 |
| „ 300 mm. | 270 | 4.91 | 1.51 | 2.50 | 4.32 | 2.84 | 1.33 | 2.11 | 1.78 | 3.26 | 3.61 | 3.77 | 0.96 | 1.05 | 8.75 | 5.54 | 2.76 | 2.07 | 1.71 | 1.99 |
| „ 42 cm. | 377 | 4.22 | 1.44 | 2.86 | 4.54 | 2.96 | 1.42 | 2.25 | 1.87 | 3.20 | 3.58 | 4.21 | 0.85 | 1.08 | 8.14 | 5.36 | 3.11 | 1.97 | 1.70 | 2.04 |

large pores. From the crown of the head out over the eye towards the point of the snout they are supported by bony lamellæ, forming a slight depression on the top of the head, deepest between the eyes, and disappearing out on the snout. This concavity is broad on the crown, and runs thence in a point towards the nostrils. The præfrontal process projects very slightly. The distance between the præfrontal and postfrontal process is less than in *alvifrons;* the breadth of frontalia between the eyes also is less than there, as will be seen from the tables. For the sake of convenience, the measurements in fish of about the same size have here been noted.

*Bathytroctes michaelsarsi*

| Length of body | Distance between præfrontal and postfrontal process | Width of frontalia opposite centre of eyes | Width of interorbital space |
|---|---|---|---|
| mm. | | | |
| 230 | 20.5 | 9.8 | 13 |
| 245 | 19.9 | 8.5 | 15 |
| 270 | 21.8 | 9.5 | 15 |
| 377 | 26 | 14.5 | 22 |

*Bathytroctes alvifrons*

| Length of body | Distance between præfrontal and postfrontal process | Width of frontalia opposite centre of eyes | Width of interorbital space |
|---|---|---|---|
| mm. | | | |
| 228 | 23 | 11 | 18 |
| 242 | 24 | 13 | 21 |
| 277 | 27 | 15 | 24 |
| 350 | 31.2 | 17 | 28 |

The frontal bony bridge between the eyes goes about 8—9 times, the actual interorbital space about 5—6 times into the length of head. The postfrontal process is very prominent behind the eye, the squamosum slightly so. The crown goes $2^3/_5$ to 3 times into the length of head. There is a bony process on the operculum, with radial ridges distinctly emanating. The postorbital portion of the head is about half the entire length of head.

The anus is somewhat nearer the caudal fin than the head, about the commencement of the last third of the body, and either midway between the ventral and anal fins or nearer the latter. Thus the ventral fin is set in front of the last third of the body, comparatively farther forward than in *alvifrons*; in the latter, the anus is close behind the ventral fins. Behind the anus there is a small papilla. The dorsal fin commences in front of the anus, close behind the vertical through the base of the ventral fins; it terminates above the 5th to 6th ray of the anal. The anal fin begins under the 9—12th ray of the dorsal; its base is less than that of the latter, about $^2/_3$. The lateral line lacks all scales, and the scale pockets are partly indistinguishable, it is possible to see, however, that their number must have been about 45—50.

***Bathytroctes nasutus,*** n. sp.

Pl. III, fig. 10.

1 specimen, abt. 19 cm., St. 53, 9/6, N. 34° 59′, W. 33° 1′, 2865 m., yellow hard clayish mud.

D. 14, A. 11, V. 7, P. 8.

There is only a poor specimen of this *Bathytroctes,* but since it differs from all described species by its pointed head, it should evidently be noted as a distinct species. From the related species *alvifrons* and *michaelsarsi*, it differs mainly by its inferior height of body, long snout ($1^1/_2$ times length of eye) and by the fact that neither præmaxilla nor maxilla have triangular or crescent-shaped plates on the outer side.

Height of body is here scarcely more than $^1/_7$ length of same, decreasing evenly, but not much, towards the caudal fin, the height of caudal peduncle being not far from $^2/_3$ height of body. Height of caudal peduncle is to the length, measured from dorsal to caudal fin, as 1 : 2.42, measured from anal fin to caudal fin, the caudal peduncle is almost twice as long as it is high. Length of caudal peduncle goes $4^1/_5$ times into length of body.

The head goes $3^1/_3$ times into length of body, the snout $2^3/_4$ and the eye 4 times into the head. Eye slightly oval. The præmaxillæ are broad in front, meeting at an angle, so as to form a pointed roof with its ridge out over the mandible. The forepart of their rows of teeth curves forward, making the edges of a furrow in front of the mandible. There is a row of inward curving teeth on præmaxilla and maxilla, larger on the former; on the maxilla, they are so small as to give the impression that this has merely a crenelated edge. The mandible has, near the symphysis, a row of about 7 teeth outside the row which follows the dental throughout its whole length. The vomer has about 3 teeth, the palatina a row of 7. The tongue is toothless and short, the floor of the mouth being partly covered by the branchial arches with their finger-shaped papillæ. The maxilla reaches to the posterior edge of the iris. The mandible has a projecting tooth under the symphysis.

The upper contour of the head is straight, it forms an angle of 40° with the mandible, which slopes upward. The snout is narrow, and its side curves inward. At the small process near the fore-end of the maxilla *i. e.* near the expansion of the ethmoideum in front, it is slightly less than half the breadth of the crown. Midway between this and the præocular process at the narrowest point of the snout, it is hardly more than $^1/_7$ the breadth of the crown, and at the præocular process it is again slightly more than half the breadth of the crown. The portion of the head between the eyes is likewise narrow; the

interorbital distance is nearly half the breadth of the crown, and the frontal itself between the eyes, is only about 1/3 the crown. The crown is, however, fairly broad, going only 2 3/4 into length of head. Between the lamellæ of the lateral line above the eye the forehead is concave. Below the eyes, the angulare of the two branches of the mandible come together, so that the head here is sharp, and this sharpness is continued along the isthmus, where the opercular membranes lie close together, and at any rate in the forepart of the belly. The postorbital portion of the head goes 2 3/5 times into the length of head.

The pectoral fins are placed immediately behind the head, their upper origin is slightly below the middle of the body; they are rather long, extending over 2/3 the distance from their base to the ventral fins; these latter are situated about the middle of the fish, caudal fin included, and reach to the anal fin. The anus is slightly in rear of their base, a little in front of the middle of the distance between the head and the caudal fin. The dorsal fin commences straight above the anus, and ends above the 6th ray of the anal, at the beginning of the first third of the distance between head and caudal fin. The origin of the anal fin is situate under the 10th ray of the dorsal fin.

The lateral line has presumably had about 50 scales, this is, however, not easy to determine, as both scales and skin were scraped off in process of capture.

| | |
|---|---|
| Total length | abt. 185 |
| Length of body | 160 |
| Height of body | 23 |
| Height of caudal peduncle | 14 |
| Dorsal to caudal fin | 38 |
| Anal to caudal fin | 29 |
| Length of head | 48 |
| Length of snout | 17.5 |
| Horizontal diam. of eye | 12 |
| Vertical diam. of eye | 10 |
| Width of snout at foreend of ethmoideum | 8 |
| Width of snout midway between point of snout and eye | 2.5 |
| Width at præfrontal process | 9.2 |
| Width of frontalia opposite centre of eyes | 5.8 |
| Width of interorbital space | 8 |
| Width of head between postfrontal and squamosum | 17 |
| Length of postorbital part of head | 18.5 |
| Distance between head and anus | 51 |
| Anus to caudal fin | 59 |
| Snout to ventral fin | 91.8 |
| Snout to dorsal fin | 99 |
| Snout to anus | 97 |
| Snout to anal fin | 113 |
| Dorsal fin basis | 21 |
| Anal fin basis | 17 |
| Length of body: Height of body | 6.96 |
| Height of body: Height of caudal peduncle | 1.64 |
| Dorsal to caudal fin: Height of caudal peduncle | 2.42 |
| Anal to caudal fin: Height of caudal peduncle | 2.07 |
| Length of body: Dorsal to caudal fin | 4.20 |
| „ „ : Length of head | 3.34 |
| Length of head: Length of snout | 2.74 |
| „ „ : Horizont. diam. of eye | 4.00 |
| Horiz. diam. of eye: Length of snout | 0.69 |
| „ „ : Vertical diam. of eye | 1.20 |
| Width of head between postfront. and squamosum: Width of foreend of snout | 2.12 |
| Width of head between postfront. and squamosum: Width midway on snout | 6.80 |
| Width of head between postfront. and squamosum: Width at præfront. process | 1.85 |
| Width of head between postfront. and squamosum: Width of frontalia | 2.94 |
| Length of head: Width of head between postfront. and squamosum | 2.82 |
| Length of head: Length of postorbital part of head | 2.59 |

### *Bathytroctes rostratus,* Günther.

1887. *Bathytroctes rostratus,* Günther (No. 43, pag. 227, pl. LVIII, fig. B).
1896. „ „ (Günther), Koehler (No. 57, pag. 516).
1906. „ „ „ Brauer (No. 8, pag. 17, pl. XIV, figs. 2, 3).
1906 (1908). „ „ „ Holt & Byrne (No. 48, pag. 45, pl. IV, figs. 3—5).
1911. „ „ „ Zugmayer (No. 92, pag. 5, pl. 1, fig. 1).

2 specimens, abt. 5 and abt. 16 cm., St. 29, 9-10/5, N. 35° 10′, W. 7° 55′, caught in youngfish-trawl with 2000 metres wire out.

1 specimen, 11 1/2 cm., St. 48, 31/5, N. 28°54′, W. 24°14′, abt. 5000 m.

1 specimen, 6 3/4 cm., St. 56, 10-11/6, N. 36° 53′, W. 29° 47′, 3239 m., clay and mud, caught in youngfish-trawl with 2000 metres wire out.

D. 19—22, A. 16—18, P. abt. 19—22, V. 7—8, lat. line abt. 90—100, tr. 22—23.

These fish differ from GÜNTHER's original description in several respects, as for instance in the shape of the body, the proportion length of eye to length of head, shape of the rostral teeth in the præmaxilla, and the position of the dorsal fin; compared with the other descriptions of *B. rostratus*, however, these specimens from the "Michael Sars" must also be ascribed to this species.

The back is sharply compressed, the belly flat. Save for small specimens under 50 mm., the back rises in a convex curve behind the head, so that the height of the body at the pectoral fin is greater than that of the head. This is also plainly visible in BRAUER's figure, whereas GÜNTHER's shows quite a different form, with the height gradually decreasing from the neck. The height of body in the two largest goes about 4 1/5 and 4 1/2 times into

the length; in the two smallest, about $5^2/_5$ and $5^1/_3$ times; GÜNTHER gives 5 times (No. 43, pag. 228). KOEHLER (No. 57, measurements pag. 516), ZUGMAYER (No. 92, measurements pag. 6) state for fish of about the same size as GÜNTHER's and the largest of the "Michael Sars" specimens, that the height of the body goes about $4^1/_3$ times into the length. BRAUER states, that young specimens are generally more slender of build (No. 8, pag. 18) and we find also that in a specimen 30 mm. long mentioned by ZUGMAYER, the height of body goes 8 times into the length. (No. 92, pag. 5).

The proportion height of caudal peduncle to height of body is about as $1:2—2^2/_3$. The length of the caudal peduncle in the two largest is slightly less than twice its height.

In the largest specimen, the head goes 4 times into the length of body; in the smaller ones about $3—3^1/_2$ times. GÜNTHER says 3 times, KOEHLER and ZUGMAYER about 4 and $4^1/_2$ times respectively. Measuring the entire aperture of the eye, as has been done throughout the present work, the length of eye in proportion to length of head in the largest specimen is as $1:2^2/_3$; in the smaller ones, as 1 : 3. GÜNTHER states this as $1:3^2/_3$; KOEHLER and ZUGMAYER as $1:3^2/_3$ and 1 : 3. Measuring the diameter of the iris only, however, the proportion in the two largest is as $1:3^2/_5$ and $1:3^3/_4$. According to GÜNTHER, the snout is equal to the length of the eye; all others, however, state that the snout is less than the eye, save in the two smallest young specimens measured by HOLT and BYRNE (No. 48, pag. 47). The proportion of the snout to the head in the "Michael Sars" specimens is approximately as $1:4^4/_5—1:3^4/_5$, as against $1:4^3/_4—1:3$ in the other statements. The maxilla reaches barely to the posterior margin of the eye as also in BRAUER's (No. 8, pl. XIV, fig. 2); in HOLT and BYRNE's small young specimens, it reaches about to the centre of the eye (No. 48, pp. 45, 46); in GÜNTHER's, on the other hand, it goes behind the eye (pl. LVIII, fig. B). In the right and left præmaxilla there are one or two inward curving rostral teeth; in this they agree with the other observations, all except GÜNTHER's; he mention them as wedge-shaped extensions, toothed at the extremity. According to his figure, they seem to be crenelated along the whole of the outer side, but this is not distinctly marked there. KOEHLER does not refer to their appearance. With regard to the dentition of the lower jaw, GÜNTHER states: "The teeth of the mandible are particularly minute, and the series is interrupted close to the symphysis, the symphysial portion being external to the lateral portion." In the specimen of 160 mm. total length it is distinctly noticeable that the mandibular series is interrupted at the symphysis; the lower lip outside the symphysis makes a curve outward, and there are here, in the skin, two rows of extremely small forward pointing teeth; corresponding to these we find two similar rows of insignificant teeth in the skin between the rostral teeth of the præmaxilla; in the 115 mm. specimen, a row of small teeth is visible inside the stronger teeth of the dentalium; these small teeth continue to the symphysis.

The infraorbital falls down over the maxilla like a mantle. The interorbital distance goes from $1^1/_3$ to $1^2/_3$ times into the length of the eye. KOEHLER's specimen has the interorbital slightly larger than the eye; in BRAUER's, the interorbital is exactly equal to the eye (No. 8, measurements pag. 18), in the smaller of HOLT and BYRNE's, half the eye. The frontalia are slightly concave. The crown and nape of the neck are flat, as in BRAUERS', but there is no longitudinal groove from neck to snout as in GÜNTHER's.

The ventral fins are set about midway between the point of the snout and the base of the caudal fin. The dorsal fin commences just above the anus, and the anal fin under the 5th rays of the dorsal, close before the last third of the body. In GÜNTHER's specimen, the dorsal fin commences in front of the anus, as also in the young specimen of 30 mm. shown by ZUGMAYER, whereas the young fish of 10—30 mm. drawn by BYRNE show the dorsal fin right over the anus or only a single ray in front. Immediately in front of the anus is a finger-shaped papilla.

The lateral line is indistinct; along the middle of the body there are 90—100 scales; across the side at the ventral fin 22—23 rows of scales.

At the clavicular symphysis there is as bony projection, such as mentioned by GÜNTHER. The unpigmented part on the crown and the white spots at the edge of the belly outside the ventral fin, at the commencement and termination of the base of the anal fin, at the base of the caudal fin, and the white cavity in front of the base of the ventral fin, mentioned by BRAUER (No. 8, pag. 17) are also present in these specimens; in addition to which, there is a groove of the same character across the belly slightly in rear of the pectoral fin. From their appearance we may suppose them to be light organs; this has not, however, been investigated as yet. There is also the black papilla above the pectoral fin. In addition to the specimens here mentioned, a number of young fry were also taken; these will be referred to elsewhere.

| Total length | Length of body | Height of body | Height of caudal peduncle | Dorsal to caudal fin | Length of head | Horiz. diam. of eye | Diam. of iris | Length of snout | Interorbital space | Snout to ventral fin | Ventral to caudal fin | Snout to anus | Snout to dorsal fin | Snout to anal fin | Dorsal fin rays | Anal fin rays | Pectoral fin rays | Ventral fin rays | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | | |
| 49 | 42.5 | 8 | 3 | — | 14.5 | 5 | 4.1 | 3.8 | 3 | 22 | 20.7 | 25.2 | 25.5 | 27 | 22 | 17 | abt. 19 | 7 | "M. S." St. 29 |
| 67 | 57 | 10.5 | 5.5 | — | 17 | 5.7 | 4.9 | 4.5 | 3.7 | 29 | 28 | 35 | 35 | 36 | 20 | 18 | 22 | 8 | „ „ 56 |
| 115 | 89 | 20 | 9 | 17 | 26 | 8.7 | 7 | 6.2 | 8 | 46 | 44 | — | 57 | 58.5 | 19 | 17 | „ 21 | 7 | „ „ 48 |
| abt. 160 | 138 | 33 | 15 | 28 | 34 | 13 | 10 | 7 | 10 | 71.5 | 70 | — | 88 | 91 | 19 | 16 | 21 | 8 | „ „ 29 |
| [1]) 165 | 147.5 | 31 | 12 | 31 | 48 | 13 | — | 13 | 9 | 78 | 72 | 97 | 92 | 101 | 20 | 17 | 16 | 9 | Günther "Challenger" |
| | 133 | 31 | 15 | 17 | 30 | 10 | — | 8 | — | — | — | — | — | — | 17 | 16–17 | 16–17 | 9 | Zugmayer "Princesse Alice" |
| | 130 | 30 | — | — | 33 | 9 | — | 7 | 10 | — | — | — | 80 | 84 | — | — | — | — | Koehler "Caudan" |
| | 81 | 17 | 8.5 | — | 23 | 6.5 | — | 5.25 | 6.5 | 41 | — | 51 | 51 | — | 17 | 17 | 17 | 9 | Brauer "Valdivia" |
| | 32 | 5 | 2 | — | 10.5 | 3.5 | — | 3.25 | 2 | — | — | — | 18.5 | 20 | 17 | 18 | — | — | Holt and Byrne "Helga" |
| | 27.5 | 4.75 | 1.5 | — | 9.5 | 3 | — | 3 | 1.5 | — | — | — | 17 | 18 | abt. 17 | abt. 18 | — | — | |
| | 14 | — | — | — | 4.5 | — | — | 1.5 | — | — | — | — | 8.5 | 9.5 | „ 17 | „ 18 | — | — | |

| Total length | Length of body | Length of body: Heigth of body | Height of body: Height of caudal peduncle | Length of body: Length of head | Length of head: Horizont. diam. of eye | Length of head: Diam. of iris | Length of head: Length of snout | Horizont. diam. of eye: Length of snout | Horizont. diam. of eye: Interorb. space | Material |
|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | |
| 49 | 42.5 | 5.31 | 2.66 | 2.93 | 2.90 | 3.54 | 3.82 | 1.32 | 1.67 | "M. S." St. 29 |
| 67 | 57 | 5.42 | 1.91 | 3.35 | 2.98 | 3.47 | 3.78 | 1.27 | 1.54 | „ „ 56 |
| 115 | 89 | 4.45 | 2.23 | 3.42 | 2.99 | 3.72 | 4.20 | 1.40 | 1.12 | „ „ 48 |
| abt. 160 | 138 | 4.18 | 2.20 | 4.06 | 2.62 | 3.40 | 4.86 | 1.86 | 1.3 | „ „ 29 |
| [1]) 165 | 147.5 | 4.76 | 2.58 | 3.08 | 3.69 | — | 3.69 | 1.00 | 1.45 | Günther "Challenger" |
| | 133 | 4.29 | 2.06 | 4.44 | 3.00 | — | 3.75 | 1.25 | — | Zugmayer "Princesse Alice" |
| | 130 | 4.33 | — | 3.94 | 3.67 | — | 4.71 | 1.29 | 0.9 | Koehler "Caudan" |
| | 81 | 4.8 | 2.00 | 3.5 | 3.4 | — | 4.38 | 1.2 | 1.0 | Brauer "Valdivia" |
| 12—17 | — | 6–7 | — | 3 | 2.5 - 2.8 | — | — | — | — | |
| | 32 | 6.40 | 2.50 | 3.04 | 3.00 | — | 3.24 | 1.08 | 1.75 | Holt and Byrne "Helga" |
| | 27.5 | 5.79 | 3.17 | 3.90 | 3.17 | — | 3.17 | 1.00 | 2.00 | |
| | 14 | — | — | 3.11 | 3.00 | — | 3.00 | 1.00 | — | |

[1]) Measured on the figure.

***Narcetes pluriserialis,*** Garman.

1899. *Narcetes pluriserialis,* Garman (No. 26, pag. 289, pl. LVII, fig. 3).
(?) 1906. *Narcetes affinis,* Lloyd (No. 61 a, pag. 308).
„ 1908. „ „ Lloyd (No. 1 b, pt. IX, pl. XLII, fig. 1).
„ 1909—10. *Narcetes affinis,* Lloyd (No. 61 b, pag. 149).

2 specimens, abt. 46—49 cm., St. 25, 5/8, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

1 specimen, abt. 54 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

D. 17—18, A. 15—16, V. 9, P. 10—11, lat. line 60—70.

In the shape of the body, these three fish resemble *N. erimelas,* Alcock (No. 1 a, pag. 175; 1 b, pl. IV, fig. 1), agreeing otherwise, however, with Garman's description of *pluriserialis*, the greatest height being close behind the pectoral fin, after which the height of body decreases gradually down towards the caudal fin, as in *N. erimelas.* The proportion between height and length of the body is as 1 : 5—5 1/3. In *erimelas,* about 5 1/3, whereas Garman's *pluriserialis* has 6 1/2 or 7. Garman states "moderately compressed, very long, tapering comparatively little, depth about one seventh of the total" (No. 26, pag. 290). His figure shows (No. 26, pl. LVII, fig. 3) that the body is of almost uniform height from the head to the dorsal fin, and that the proportion between height and length of the body is as 1 : 6 1/2. On the other hand, there is a conspicuous difference in the proportion between the height of the caudal peduncle and the distance from anal fin to base of caudal fin. This is in *erimelas* as 1 : 1.32; in *pluriserialis* as 1 : 2.16—2.85, the anal fin being set farther back in *erimelas* than in *pluriserialis.*

| Total length | Length of body | Height of body | Height of caudal peduncle | Dorsal to caudal fin | Anal to caudal fin | Length of head | Length of snout | Horizont. diam. of eye | Vertical diam. of eye | Interorbital space | Width of head between postfront. and squamosum | Length of postorbit. part of head | Snout to ventral fin | Snout to dorsal fin | Snout to anus | Snout to anal fin | Length of basis of dorsal fin | Length of basis of anal fin | Dorsal fin rays | Anal fin rays | Ventral fin rays | Pectoral fin rays | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cm. | | | | | | | | | | | | | | | | | | | | | | | |
| abt. 46 | 408 | 77 | 35.5 | 99 | 76.5 | 122.5 | 36.5 | 18 | — | 27 | 40 | 70 | 228 | 252 | 276 | 285 | 71 | 51 | 17 | 15 | 9 | 11 | 25 |
| „ 49 | 430 | 85 | 32 | 105 | 81.2 | 127 | 38 | 19 | — | 31 | 44 | 77 | 241 | 283 | 289 | 302 | 60 | 46 | 18 | 16 | 9 | 11 | 25 |
| „ 54 | 490 | 95 | 34 | 118 | 97 | 135 | 39 | 22 | 18 | 33 | 45 | 81 | 269 | 309 | 333 | 346 | 66.7 | 48 | 18 | 15 | 9 | 10 | 95 |

| Total length | Length of body | Total length: Height of body | Length of body: Height of body | Anal to caudal fin: Height of caudal peduncle | Length of body: Length of head | Total length: Length of head | Length of head: Length of snout | Length of head: Horiz. diam. of eye | Horiz. diam. of eye: Vertic. diam. of eye | Interorbit. space: Horiz. diam. of eye | Length of head: Interorbital space | Length of head: Width of head between postfront. and squamosum | Length of head: Length of postorbit. part of head | Length of body: Snout to ventral fin | Length of body: Snout to dorsal fin | Length of body: Snout to anal fin | Dorsal fin basis: Anal fin basis | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cm. | | | | | | | | | | | | | | | | | | |
| abt. 46 | 408 | 5.98 | 5.30 | 2.16 | 3.33 | 3.75 | 3.37 | 6.81 | — | 1.50 | 4.54 | 3.06 | 1.75 | 1.79 | 1.62 | 1.43 | 1.39 | 25 |
| „ 49 | 430 | 5.76 | 5.06 | 2.54 | 3.39 | 3.86 | 3.34 | 6.69 | — | 1.63 | 4.10 | 2.89 | 1.65 | 1.78 | 1.52 | 1.42 | 1.30 | 25 |
| „ 54 | 490 | 6.20 | 5.16 | 2.85 | 3.63 | 4.00 | 3.46 | 6.14 | 1.22 | 1.50 | 4.09 | 3.00 | 1.67 | 1.82 | 1.59 | 1.42 | 1.39 | 95 |

The back is round, the belly compressed. The proportion of the head to length of body is as 1 : 3.33—3.69; to the total length about as 1 : 3.75—4.00. Garman states: "Head . . . one fourth of the entire length". Measured from his figure, the proportion between head and length of body is as 1 : 3.34; and that between head and total length 1 : 3.62.

The upper profile of the head is almost straight, forming only a slight convex curve in front of the eye. The snout and præmaxillæ project sharply. The angle between the upper contour of the snout and the mandible is between 50° and 60°. The length of the snout is about 1/3 that of the head. The eye is oval; its length is about half that of the snout, and goes from about 6 to 6 3/4 times into the length of the head. The præmaxilla projects out in front of the mandible and is about half as long as the dentary portion of the maxilla. The maxilla reaches far beyond the eye; its posterior portion is rounded, and breadth about equal to the vertical diameter of the eye. The mandible has a projecting chin. The branch of the

lateral line on the under side of the mandible opens with fully 7 large pores in all. The præmaxilla and the mandible have several series of teeth, the maxilla an outer row of small ones and an inner one of large. The vomer has up to three teeth on either side. The palatina is also armed with comparatively powerful teeth. The branchial arches with their papillæ extend far out in the mouth. The interorbital space is great; about 1/8 or 2/5 more than the horizontal diameter of the eye, and between 1/4 and 1/5 the length of the head. Breadth of crown more than twice the length of the eye, and about 1/3 the length of the head. The head is flat at the top, or slightly convex, but the supporting lamellæ of the lateral line are here visible, and will probably produce the concavity mentioned by GARMAN when the membranes are damaged. The postorbital portion of the head is large, not far from 2/3 of the entire head.

The ventral fins are situate about the middle of the body, reckoning with the caudal fin. Slightly in rear of them, but nearer the anus, the dorsal fin commences. The anus is placed about the commencement of the last third of the body. Close behind the anus, under the 8—12th ray of the dorsal fin, the anal fin commences; the length of its base is to that of the dorsal fin as 1 : 1.3—1.39.

Dorsal to the base of pectoral fin is situated a triangular lobe of the skin containing a scale as support. The lateral line has between 60 and 70 scales, but the longitudinal row above it has about 100. GARMAN gives 105 for the lateral line, but his figure shows 57 pores in the lateral line and 105 scales in the row above it. Probably *Narcetes affinis,* LLOYD, is identical with *Narcetes pluriserialis,* GARMAN (No. 61 a, pag. 308; No. 1 b, pt. IX, pl. XLII, fig. 1; No. 61 b, pag. 149). In the lateral line it has 73 scales, but in the series next over abt. 97. As in *Narcetes* from "Michael Sars" the maxilla of *Narcetes affinis* has "an outer series of small teeth and an inner series of larger ones". As in *pluriserialis,* GARMAN, so in *affinis,* LLOYD, there is "one enlarged tooth on either side of the vomer." On the specimens from "Michael Sars" the number varies between 1 and 3.

### ***Talismania mollis,*** Koehler.

Pl. III, fig. 5.

1896. *Bathytroctes mollis,* Koehler (No. 57, pag. 517, pl. XXVI, fig. 2).
1916. *Talismania mollis,* L. Roule (No. 79 b, pag. 11).
1919. „ „ L. Roule (No. 79 c, pag. 6, pl. I, fig. 1).

7 specimens, 34—41 cm., Stat. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

11 specimens, 13—46 cm., Stat. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

D. 16—20, A. 17—20, V. 6—7, P. 5—7.

The height of the body is greatest at the neck, being there 1/5 the length of the body; the proportion is as 1 : 4 1/2—5 1/2. The height of the caudal peduncle goes 2 2/3 to 3 1/2 times into the height at the neck; its proportion to the length of the caudal peduncle, *i. e.* distance from dorsal fin to middle of caudal fin, is as 1 : 2 1/2—3 1/2. The caudal peduncle is thus somewhat more slender than in KOEHLER's specimen; he states that it is half as high as it is long (No. 57, pag. 518); in one case, its height is equal to the longitudinal diameter of the eye, as in KOEHLER's specimen, otherwise less; but judging from the figure, KOEHLER has measured the greatest height of the caudal peduncle, whereas, in this case, the minimum height has been taken.

The length of the head goes from 2 2/3 to 3 1/5 times into the length of the body; the length of the snout about 3 1/2—4 1/5 into that of the head, and the horizontal diameter of the eye from 4 1/5 to 4 4/5 times into the same. The length of the eye in proportion to the snout is as 1 : 1 1/10—1 4/10. The eye is slightly oval; its upper edge lies close in to the upper profile of the head, which forms a slight convex curve. The præmaxillæ are broad in front; at the symphysis they curve slightly forward, meeting in an acute angle of about 10° and thus forming a slight keel in front of the ethmoideum; at the rear they extend slightly under the maxilla; this latter is strongly developed in its hinder part, and reaches to slightly behind the posterior margin of the eye. The præmaxillæ and the maxilla, as well as the mandible, which they embrace, are armed with a row of small teeth. Neither vomer, palatina nor tongue, however, have teeth. The palate is highly folded, and has small papillæ; the tongue also has small papillæ, along the one median and the three low lateral folds at either side. It is short, so that the branchial arches with their dentigerous gill-rakers lie far forward in the mouth. The lower jaw has a distinctly prominent process on the chin. The interorbital space does not differ greatly from the longitudinal diameter of the eye, and is more than 2/3 the length of the snout; the breadth of the actual frontalia, however, between the eyes is generally less than 2/3 the length of the snout; only in two cases a very little greater. Above the eye, inside the branch of the lateral line, there is a slight keel, which forms a small concavity in the middle of the crown and frontalia; this is, however, not so pronounced as indicated by KOEHLER (No. 57, pag. 517). As stated by KOEHLER also, there is a process on the operculum, from which extend two keels, a projection on the squamosum and on the postfrontal. The branches of the lateral line on the head and about the eye, as also over the præoperculum out on to the mandible, are very

(Total length in cm. other measurements in mm.).

| Total length | Length of body | Height of body | Height of caudal peduncle | Dorsal to caudal fin | Length of head | Length of snout | Horizontal diam. of eye | Width of frontalia opposite centre of eyes | Width of interorbital space | Width of head between postfrontal and squamos. | Postorbital part of head | Snout to ventral fin | Ventral to caudal fin | Snout to anus | Dorsal fin basis | Anal fin basis | Dorsal fin rays | Anal fin rays | Pectoral fin rays | Ventral fin rays | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cm. | | | | | | | | | | | | | | | | | | | | | |
| above 13 | 122 | 26.5 | 8.5 | 22.9 | 42 | 11 | 10 | abt. 6.5 | — | abt. 11 | abt. 26 | abt. 67 | abt. 57 | abt. 77 | 19 | 19 | 18 | 18 | 6 | 6 | 25 |
| „ 23 | 210 | 43 | 13 | 39 | 74 | 19.8 | 17 | 11.7 | — | 24 | 44 | 111 | 100 | 135 | 35 | 34 | 20 | 20 | 5 | 6 | 25 |
| about 32 | 285 | 59 | abt. 17 | 53 | 103 | 27 | 23 | 15.5 | — | 35 | 55 | 150 | 130 | 173 | 52 | 50 | 19 | 20 | — | 6 | 25 |
| „ 34 | 300 | 56 | 21 | 51 | 104 | 25 | 22.5 | 16.5 | — | 36 | 63 | 155 | — | — | 52 | 49 | 20 | 18 | 7 | 7 | 24 |
| 35 | 300 | 62 | 20 | 53 | 105 | 30 | 24 | 16.5 | — | 38 | 59 | 155 | 147 | 184 | 48 | 42 | 18 | 17 | 6 | 6 | 24 |
| above 34 | 315 | 69 | 21 | 57 | 118.5 | 31 | 25 | 17 | 24 | 39 | 69 | 170 | 146 | 206 | 50 | 46 | 19 | 19 | 5 or 6 | 6 | 25 |
| „ 35 | abt. 320 | 61 | 18 | 60 | 108 | 29 | 23 | 20 | — | 38 | abt. 63 | 159 | 154 | 194 | 55 | 49 | 18 | 18 | 6 | 6 | 24 |
| 36 | 320 | 67 | 20 | — | 112 | 32 | 25 | 19 | — | 40 | 64 | 166 | 150 | 205 | 48 | 48 | 19 | 19 | 7 | 6 | 25 |
| about 35 | 325 | 60 | 19 | — | 102 | 26 | 23 | 15.5 | — | 36 | 59 | 161 | 159 | 205 | 43 | 46 | 18 | 19 | — | 6 | 25 |
| 38 | 335 | 62 | 23 | 60 | abt. 111 | 31 | 24 | 18 | — | 38 | abt. 68 | 172 | 151 | 206 | 53 | 50 | 19 | 19 | 6 | 6 | 24 |
| above 37 | 345 | 67 | 22 | — | 113 | 30 | 24 | 19 | 26 | 38.5 | 68 | 171 | 164 | 218 | 51 | 51 | 18 | 18 | 6 | 6 | 25 |
| about 40 | 350 | 69 | 25 | 62 | 118 | 31 | 26 | 18 | — | 39 | 70 | 164 | 174 | 214 | 59 | 56 | 19 | 20 | 6 | 6 | 24 |
| above 38 | abt. 350 | 72 | abt. 25 | 61 | 126 | 34 | 28.7 | 19.5 | — | 43 | 69 | 188 | 163 | 224 | 59 | 56 | 19 | 19 | 6 | 6 | 25 |
| about 40 | 355 | 70 | 23 | 65 | 122 | 33 | 26 | 17 | 24 | 39 | 73 | 174 | 170 | 223 | 56.5 | 53 | 18 | 17 | 6 | 6 | 24 |
| „ 40 | abt. 360 | 70 | 25 | — | 114 | 32 | 26 | 18 | 22 | 41 | abt. 64 | 183 | 170 | abt. 222 | 54 | 55 | 18 | 18 | 5? | 6 | 25 |
| 41 | 360 | 71 | 25 | 65 | 122 | 32 | 26 | 20 | — | 44 | 71 | 185 | 171 | 226 | 53 | 54 | 19 | 17 | 6 | 6 | 24 |
| 45 | 392 | 78 | 27 | — | 130 | 38 | 27 | 21 | 26 | 43 | 73 | 200 | 189 | — | 65 | 68 | 16 | 20 | 7 | 6 | 25 |
| about 46 | abt. 392 | abt. 80 | 27 | — | 130 | 33 | 29 | 18 | 24 | 43 | 80 | 201 | 192 | 246 | 64 | 62 | 19 | 19 | — | 6 | 25 |

| Total length | Length of body | Length of body: Height of body | Height of body: Height of caudal peduncle | Dorsal to caudal fin: Height of caudal peduncle | Length of body: Length of head | Length of head: Length of snout | Length of head: Horizont. diam. of eye | Length of snout: Horizont. diam. of eye | Length of snout: Width of frontalia opposite centre of eyes | Length of snout: Width of interorbital space | Length of head: Width of frontalia opposite centre of eye | Length of head: Width of interorbital space | Length of head: Width of head between postfront. and squamosum | Length of head: Postorbital part of head | Length of body: Snout to ventral fin | Length of body: Snout to anus | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cm. | mm. | | | | | | | | | | | | | | | | |
| above 13 | 122 | 4.60 | 3.12 | 2.70 | 2.90 | 3.82 | 4.20 | 1.10 | 1.69 | — | 6.46 | — | 3.82 | 1.61 | 1.82 | 1.59 | 25 |
| „ 23 | 210 | 4.89 | 3.31 | 3.00 | 2.84 | 3.74 | 4.35 | 1.17 | 1.45 | — | 6.31 | — | 3.08 | 1.68 | 1.89 | 1.56 | 25 |
| about 32 | 285 | 4.84 | 3.47 | 3.12 | 2.76 | 3.82 | 4.48 | 1.17 | 1.74 | — | 6.65 | — | 2.94 | 1.87 | 1.90 | 1.65 | 25 |
| 34 | 300 | 5.35 | 2.66 | 2.42 | 2.88 | 4.16 | 4.62 | 1.11 | 1.52 | — | 6.30 | — | 2.90 | 1.65 | 1.93 | — | 24 |
| 35 | 300 | 4.84 | 3.10 | 2.65 | 2.86 | 3.50 | 4.37 | 1.25 | 1.82 | — | 6.36 | — | 2.76 | 1.78 | 1.94 | 1.63 | 24 |
| above 34 | 315 | 4.56 | 3.28 | 2.72 | 2.66 | 3.82 | 4.74 | 1.24 | 1.82 | 1.29 | 6.98 | 4.94 | 3.04 | 1.72 | 1.85 | 1.53 | 25 |
| „ 35 | abt. 320 | 5.25 | 3.38 | 3.34 | 2.96 | 3.73 | 4.70 | 1.26 | 1.45 | — | 5.40 | — | 2.84 | 1.72 | 2.01 | 1.65 | 24 |
| 36 | 320 | 4.78 | 3.35 | — | 2.86 | 3.50 | 4.48 | 1.28 | 1.68 | — | 5.90 | — | 2.80 | 1.75 | 1.93 | 1.56 | 25 |
| about 35 | 325 | 5.42 | 3.16 | — | 3.19 | 3.92 | 4.44 | 1.13 | 1.68 | — | 6.59 | — | 2.84 | 1.73 | 2.02 | 1.59 | 25 |
| 38 | 335 | 5.41 | 2.70 | 2.60 | 3.02 | 3.58 | 4.63 | 1.29 | 1.72 | — | 6.17 | — | 2.92 | 1.63 | 1.95 | 1.63 | 24 |
| above 37 | 345 | 5.15 | 3.04 | — | 3.05 | 3.77 | 4.71 | 1.25 | 1.58 | 1.15 | 5.95 | 4.35 | 2.94 | 1.66 | 2.02 | 1.58 | 25 |
| about 40 | 350 | 5.07 | 2.76 | 2.48 | 2.96 | 3.81 | 4.58 | 1.19 | 1.72 | — | 6.56 | — | 3.03 | 1.69 | 2.14 | 1.63 | 24 |
| above 38 | abt. 350 | 4.86 | 2.88 | 2.44 | 2.78 | 3.71 | 4.39 | 1.19 | 1.74 | — | 6.46 | — | 2.94 | 1.83 | 1.86 | 1.56 | 25 |
| about 40 | 355 | 5.07 | 3.04 | 2.82 | 2.92 | 3.70 | 4.69 | 1.27 | 1.94 | 1.37 | 7.19 | 5.09 | 3.13 | 1.67 | 2.04 | 1.59 | 24 |
| „ 40 | abt. 360 | 5.14 | 2.80 | — | 3.16 | 3.56 | 4.39 | 1.23 | 1.78 | 1.45 | 6.34 | 5.18 | 2.78 | 1.78 | 1.97 | 1.62 | 25 |
| 41 | 360 | 5.07 | 2.84 | 2.60 | 2.95 | 3.81 | 4.70 | 1.23 | 1.60 | — | 6.10 | — | 2.77 | 1.72 | 1.95 | 1.59 | 24 |
| 45 | 392 | 5.02 | 2.89 | — | 3.02 | 3.42 | 4.82 | 1.42 | 1.81 | 1.46 | 6.19 | 5.00 | 3.02 | 1.78 | 1.96 | — | 25 |
| about 46 | abt. 392 | 4.90 | 2.96 | — | 3.02 | 3.94 | 4.48 | 1.14 | 1.83 | 1.38 | 7.23 | 5.42 | 3.02 | 1.63 | 1.95 | 1.59 | 25 |

distinct, with large pores. The length of the postorbital part of the head goes on an average $1^3/_4$ times into the length of the whole head.

The ventral fins are placed in the middle of the body, the anus slightly in front of the commencement of the posterior third, the dorsal fin right above the anus and the anal fin slightly in rear. The ventral fins reach to the anus. The pectoral fins are near the edge of the belly, immediately behind the opercular flap. The lateral line lies like a tube under the skin, opening with distinct pores. There are neither scales nor scale pockets to be seen.

### *Platytroctidæ.*

Roule 1919 (No. 79 c, pag. 14).

#### ***Platytroctes apus,*** Günther.

1887. *Platytroctes apus,* Günther (No. 43, pag. 229, pl. LVIII, fig. A).
1899. „ „ (Günther), Alcock (No. 1 a, pag. 177).
1906. „ *procerus,* Brauer (No. 8, pag. 23, fig. 3).
1911. „ *apus,* (Günther), Zugmayer (No. 92, pag. 8).
1916. „ „ „ Roule (No. 79 b, pag. 12).
1919. „ „ „ „ (No. 79 c, pag. 14, pl. 1, figs. 4 a—c).

1 specimen, 19 cm., Stat. 35, 18-19/5, N. 27° 27′, W. 14° 52′, 2603 m.

D. 21, A. 19, P. 22.

Like *Bathytroctes rostratus*, *Platytroctes* has a dark papilla above the pectoral fin and a bony projection at the clavicular symphysis; this is, however, here far more developed, and extends right out under the isthmus.

The present specimen corresponds entirely to the previous descriptions, save for a slightly larger number of rays in the fins. It agrees with the two from the "Investigator" (No. 1 a, pag. 177) and the "Princesse Alice" (No. 92, pag. 9) as also with the specimen described by ROULE (No. 79 b, pag. 12; No. 79 c, pag. 15 & 16) in having the snout less than the eye; the snout being 11 mm. and the eye 17.

The papilla on the dorsal side of the pectoral fin is found both in ZUGMAYER's and the present specimen, the latter, moreover, having also 4 papillæ on the dorsal and ventral side of the caudal peduncle. It is therefore evident, as BRAUER also considered possible (No. 8, pag. 24), that the difference in shape of body and length of upper jaw between his young *Platytroctes procerus* and *Platytroctes apus* is only due to difference in age.

## SUBORDER APODES.

### *Synaphobranchidæ.*

#### ***Synaphobranchus pinnatus,*** Gronov.

Pl. II, fig. 2.

1887. *Synaphobranchus pinnatus,* (Gronovius), Günther (No. 43, pag. 253, pl. LXII, fig. A).
1888. „ „ (Gray), Vaillant (No. 86, pag. 88, pl. VI, figs. 2—2 c).
1895. „ „ (Gronovius), Goode & Bean (No. 37, pag. 143, fig. 164).
1896. „ „ „ Collett (No. 13 b, pag. 154).
1896. „ „ „ Jordan & Evermann (No. 56 I, pag. 351).
1899. „ „ „ Alcock (No. 1 a, pag. 195).
1905 (09). „ „ „ Collett (No. 14 b pag. 45).
1905 (06). „ „ „ Holt & Byrne (No. 47, pag. 7).
1909. „ „ var. *brevidorsalis,* Lloyd (No. 61 b, pag. 152).

3 specimens, 15—35 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

16 specimens, 10—28 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

3 specimens, 26—48 cm., St. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

15 specimens, 25—35 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

2 specimens, 39—55 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

3 specimens, 30—39 cm., St. 101, 7/8, N. 57° 41′, W. 11° 48′, 1853 m., hard clay.

As will be seen from the measurements, the distance from anus to commencement of dorsal fin varies from half length of head to over full length of same, so that this character cannot be taken as of importance in distinguishing between *Synaphobranchus pinnatus* and *brevidorsalis;* GÜNTHER states, however, that the scales of *pinnatus* are lanceolate, those of *brevidorsalis* (No. 43, pp. 253, 255) rounded. This is also distinctly shown in his figure.

The species *brachysomus* is, according to GILBERT (No. 31, pag. 583), distinguished from *pinnatus* "in the much shorter trunk, and in the white margins of the fins". GILBERT gives the "distance from tip of snout to front of anal" as 28 % of total length, but VAILLANT gives the length of tail in a *pinnatus* 600 mm. long as 430 mm. which would make the length of trunk 28.4 % of the total length. In the young specimens of 118 mm., described by HOLT & BYRNE (No. 47, pag. 8), the trunk is only 23.7 % of

| Total length | Length of head | Cleft of mouth | Length of snout | Length of eye | Interorbital space | Length of gill-opening | Height of head just before eye | Height of body at anus | Snout to dorsal fin | Snout to anal fin | Snout to anus | Snout to pectoral fin | Pectoral fin to anus | Length of pectoral | Length of tail | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | |
| 99 | 11.5 | 9 | 4.5 | 2.7 | abt. 2 | — | (abt. 4) | 4 | (abt. 33) | 27 | 25 | 13.5 | 11.5 | — | 72 | 23 |
| 153 | 18.2 | 12 | 7.1 | 3.5 | 3.2 | 2.5 | 6 | 8 | (abt. 51) | 42 | 41 | 19.5 | 22 | 10 | 111 | 4 |
| 153 | 19 | 13.5 | 7.5 | 3.5 | 3 | 3 | 7 | 8.5 | (abt. 48) | 41 | 39 | 21 | 20 | 10 | 113 | 23 |
| 252 | 28 | 21 | 11 | 4.8 | 4 8 | 3.5 | 8 | 14 | 91 | 69 | 66.5 | 33 | 37 | 16 | 183 | 41 |
| 267 | 29 | 19 | 12 | 5 | 4.5 | 5 | — | — | 90 | 74.5 | 71 | 35 | 39 | 14 | 267 | 23 |
| 475 | 55 | 39 | 19 | 8 | 11 | 9.5 | 14.5 | 33 | 179 | 135 | 132 | 62.5 | 79 | 26 | 339 | 24 |
| 547 | 63 | 43 | 23 | 9.2 | 13 | 9 | (abt. 18) | 32 | 188 | 158.5 | 152 | 70 | 89 | 32 | 388 | 95 |

| Total length | Length of head in percent. of total length | Cleft of mouth in percent. of length of head | Snout in percent. of length of head | Eye in percent. of length of head | Interorbital in percent. of length of head | Gill-opening in percent. of length of head | Height of head in percent. of total length | Height of body in percent. of total length | Snout to dorsal in percent. of total length | Snout to anal in percent. of total length | Snout to anus in percent. of total length | Snout to pectoral in percent. of total length | Tail in percent. of total length | Pectoral in percent. of length of head | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | |
| 99 | 11.6 | 78.3 | 39.1 | 23.4 | 17.4 | — | (4.4) | 4.4 | (32.4) | 27.3 | 25.3 | 13.6 | 72.7 | — | 23 |
| 153 | 11.9 | 65.0 | 39.0 | 19.2 | 17.6 | 13.7 | 3.92 | 5.22 | (33.4) | 27.4 | 26.8 | 12.8 | 72.5 | 55.0 | 4 |
| 153 | 12.4 | 71.0 | 39.5 | 18.4 | 15.8 | 15.8 | 4.57 | 5.55 | (31.4) | 26.8 | 25.5 | 13.7 | 74.0 | 52.5 | 23 |
| 252 | 11.1 | 75.0 | 39.3 | 17.2 | 17.2 | 12.5 | 3.18 | 5.6 | 36.1 | 27.4 | 26.4 | 13.1 | 72.6 | 57.2 | 41 |
| 267 | 10.9 | 65.5 | 41.4 | 17.2 | 15.5 | 17.2 | — | — | 33.7 | 27.9 | 26.6 | 13.1 | 72.0 | 48.4 | 23 |
| 475 | 11.6 | 71.0 | 34.6 | 14.5 | 20.0 | 17.3 | 3.06 | 6.95 | 37.7 | 28.4 | 27.8 | 13.2 | 71.4 | 47.2 | 24 |
| 547 | 11.5 | 68.3 | 36.5 | 14.6 | 20.6 | 14.3 | (3.29) | 5.85 | 35.0 | 29.0 | 27.8 | 12.8 | 71.0 | 50.8 | 95 |

the total length, and on measurement of specimens from "Michael Sars" it was found that the trunk was 26.8—29 %. ALCOCK also states, with regard to *pinnatus*, "length of tail considerably over twice that of the rest of the body" (No. 1 a, pag. 195).

Furthermore, GOODE & BEAN (No. 37, pag. 143) and JORDAN & EVERMANN (No. 56 I, pag. 351) note with regard to *pinnatus*, "vertical fins darker behind, light-edged anteriorly" and as far as the colour can be distinguished in the "Michael Sars" specimens, the dorsal and anal fins here also appear to have had a light fringe. It would thus appear to be doubtful whether the species *brachysomus* really is distinct from *pinnatus*.

In one respect, however, a difference has been found between GILBERT'S description of *brachysomus* and the specimens from the "Michael Sars". GILBERT gives (No. 31, pag. 583) "distance from tip of snout to upper axil of pectoral exceeding the distance from the latter to front of anal"; in the measured specimens from the "Michael Sars", on the other hand, the distance from tip of snout to the pectoral fin was less that from pectoral to anal, save in a single instance, where the distance of the pectoral fin from the point of snout was very slightly more than its distance from the anal fin.

COLLETT'S observation: "La hauteur du corps semble être très variable; certains individus étaient beaucoup plus élancés que d'autres bien qu'ayant la même longueur totale" (No. 13 b, pag. 155) is confirmed by the variation here noted in the height of body, amounting to 5.6—7 % of total length.

The variation of the eye with size of the fish is very great. In a specimen of 99 mm. from St. 23, the eye goes but $4^1/_4$ times into the length of head, in another of 547 mm. from St. 95, on the other hand, 8 times into the same.

The scales exhibit growth rings; in a specimen of 306 mm. from St. 41, 3 such were observed; in a 475 mm. specimen from St. 24 there were 6.

As contents of stomach, we found, in specimens from St. 23, *Amalopenæus alicei* (determined by OSCAR SUND), remains of amphipods, probably pelagic, as *Amalopenæus*. Fifteen of the 16 *Synaphobranchus* from this station were taken in a young-fish trawl for pelagic work, which touched bottom during the haul. The stomach of an individual from St. 101 contained a fish.

The first table below shows the variation in the origin of the dorsal; from the tables pag. 59 will be seen, *inter alia*, the proportion between trunk and tail.

| Total length | Anus to dorsal fin | Length of head | Length of head: Anus to dorsal | Station |
|---|---|---|---|---|
| mm. | | | | |
| 250 | 26 | 30 | 1.15 | 41 |
| 252 | 27 | 27 | 1.00 | 41 |
| 255 | 21 | 32 | 1.52 | 41 |
| 260 | 17 | 31 | 1.82 | 41 |
| 280 | 19 | 31 | 1.63 | 41 |
| 282 | 18 | 32 | 1.78 | 41 |
| 282 | 36 | 33 | 0.92 | 41 |
| 292 | 25 | 35 | 1.40 | 41 |
| 300 | 37 | 33 | 0.89 | 41 |
| 307 | 35 | 35 | 1.00 | 41 |
| 317 | 22 | 38 | 1.73 | 41 |
| 318 | 20 | 40 | 2.00 | 41 |
| 320 | 26 | 39 | 1.50 | 41 |
| 350 | 34 | 40 | 1.18 | 41 |
| 350 | 29 | 42 | 1.45 | 41 |
| 480 | 46 | 55 | 1.20 | 24 |
| 560 | 35 | 64 | 1.83 | 95 |

| Total length | Total length: Length of head | Head: Snout | Head: Eye | Snout: Eye | Head: Cleft of mouth | Head: Pectoral | Snout to dorsal: Head | Snout to anal: Head | Station |
|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | |
| 99 | 8.61 | 2.56 | 4.26 | 1.67 | 1.28 | — | (2.87) | 2.34 | 23 |
| 153 | 8.40 | 2.56 | 5.20 | 2.03 | 1.52 | 1.82 | (2.80) | 2.31 | 4 |
| 153 | 8.05 | 2.54 | 5.43 | 2.14 | 1.41 | 1.90 | (2.52) | 2.16 | 23 |
| 252 | 9.00 | 2.54 | 5.84 | 2.29 | 1.33 | 1.75 | 3.25 | 2.46 | 41 |
| 267 | 9.21 | 2.42 | 5.80 | 2.40 | 1.53 | 2.07 | 3.10 | 2.56 | 23 |
| 475 | 8.65 | 2.90 | 6.88 | 2.38 | 1.41 | 2.12 | 3.26 | 2.46 | 24 |
| 547 | 8.70 | 2.74 | 7.88 | 2.38 | 1.46 | 1.97 | 2.99 | 2.52 | 95 |

***Histiobranchus bathybius,*** Günther.

1887. *Synaphobranchus bathybius,* Günther (No. 43, pag. 254, pl. LXII, fig. B).
1892. *Histiobranchus bathybius,* (Günther), Jordan & Davis (No. 55, pag. 673).
1895. „ „ (Günther), Goode & Bean (No. 37, pag. 145).
1896. „ „ (Günther), Jordan & Evermann (No. 56, I, pag. 352).
1913. *Synaphobranchus* „ (Günther), Regan (No. 74, pag. 235).

4 specimens, 69—90 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

2 specimens, 59—81 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand, yellow mud.

1 specimen, 13 cm., St. 92, 24/7, N. 48° 29′, W. 13° 55′, in haul with young-fish trawl with 2000 m. wire out or with large net with 3000 m. wire out.

The characters found most essential for the identification of these fishes with *Histiobranchus bathybius* were as follows:

Dorsal fin commencing above base of pectoral or over fore half of same.

Eye situate nearer tip of snout than angle of mouth.

Size of eye about half length of snout, going about $1^3/_4$—$2^1/_4$ times into same.

Pectoral fin equal to or longer than snout.

Distance of dorsal fin from tip of snout $^1/_3$ or slightly less than $^1/_3$ of the distance between tip of snout and anus.

In *Histiobranchus infernalis,* GILL, on the other hand, the dorsal fin commences, according to GOODE and BEAN (No. 37, pag. 145) "not far behind the root of the pectoral" and according to REGAN (No. 74, pag. 235) even "above posterior part of pectoral."

"The eye is much less than one half the length of the snout" according to GOODE and BEAN, and

"about equidistant from snout and angle of mouth" according to REGAN.

According to GOODE and BEAN, "the pectorals are considerably shorter than the snout" and

according to REGAN, "origin of dorsal . . . from end of snout somewhat more than $^1/_3$ that from end of snout to vent."

The small *Histiobranchus* from "Michael Sars" St. 92 has also been ascribed to *bathybius,* as the eye is half as large as the snout, and the dorsal fin commences above the base of the pectoral; the determination is, however, uncertain, as the eye is slightly nearer the snout than the angle of the mouth, the pectoral fin shorter than snout, and the distance from tip of snout to dorsal fin slightly over $^1/_3$ of the distance from tip of snout to anus.

Both in the small specimen and in the large ones, the vomerine teeth are divided into an elongated ethmoidal

or præmaxillary group, followed at a slight interval by a short group on the vomer itself. The branchiostegal rays cover the branchial arches and extend out under the operculum.

LEA's counting of the vertebræ gives the number as 132 (No. 60, pp. 17, 18).

The 90 cm. specimen was a female with ova measuring 1¼ mm.; the two of 81 and 59 cm. were also females, but with ovaries less far advanced towards maturity. The specimen of 69 cm. was a male.

(Total length in cm., the other measurements in mm.).

| Total length | Length of head | Length of snout | Length of eye | Distance from eye to angle of mouth | Interorb. space | Length of pectoral fin | Snout to dorsal fin | Snout to anus | Anus to tip of tail | Sex | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| cm. | | | | | | | | | | | |
| 12.6 | 15 | 6 | 3 | 5.3 | — | 4.6 | 18 | 51 | 72 5 | — | 92 |
| 59 | 69 | 20.2 | 11 | 21 | 16.5 | 23 | 91 | 275 | 303 | ♀ | 88 |
| 69.2 | 77 | 24.5 | 11 | 28 | 21 | 25 | 94 | 313 | 367 | ♂ | 53 |
| 78 | 83 | 26 | 12.5 | 28 | 24.5 | 27.5 | 115 | 358 | 421 | — | 53 |
| 81 | 93 | 27 | 15 | 32 | 25 | 27 | 120 | 365 | 438 | ♀ | 88 |
| 81.5 | 85 | 24 | 14 | 36 | 24.8 | 29 | 112 | 372 | 420 | — | 53 |
| 90 | 85 | 26 | 15 | 35 | 27 | 30 | 121 | 382 | 402 | ♀ | 53 |

| Total length | Total length: Head | Snout: Eye | Head: Eye | Head: Interorb.: | Interorb.: Eye | Head: Pectoral fin | Snout to anus: Snout to dorsal | Anus to tip of tail: Snout to anus | Sex | Station |
|---|---|---|---|---|---|---|---|---|---|---|
| cm. | | | | | | | | | | |
| 12.6 | 8.40 | 2.00 | 5.00 | — | — | 3.26 | 2.83 | 1.42 | — | 92 |
| 59 | 8.55 | 1 84 | 6.26 | 4.18 | 1.50 | 3.00 | 3.02 | 1.10 | ♀ | 88 |
| 69.2 | 9.00 | 2.23 | 7.00 | 3.66 | 1.91 | 3.08 | 3.34 | 1.17 | ♂ | 53 |
| 78 | 9.40 | 2.08 | 6.64 | 3.39 | 1.96 | 3.02 | 3.11 | 1.18 | — | 53 |
| 81 | 8.70 | 1.80 | 6.20 | 3.72 | 1.67 | 3.44 | 3.04 | 1.20 | ♀ | 88 |
| 81.5 | 9.60 | 1.72 | 6.07 | 3.43 | 1.77 | 2.93 | 3.32 | 1.13 | — | 53 |
| 90 | 10.60 | 1.73 | 5.66 | 3.14 | 1.80 | 3.00 | 3.16 | 1.05 | ♀ | 53 |

In stomach, remains of fish were found.

These fish have, for the reasons above given, been ascribed to *bathybius,* which is known from the Pacific ocean, and not to the Atlantic species *infernalis;* it is possible, however, that the question may turn out to be, not whether *bathybius* occurs both in the Pacific and in the Atlantic, but whether *bathybius* and *infernalis* should not be taken as one and the same species. Both GÜNTHER (No. 43, pag. 254), and JORDAN and DAVIS (No. 55, pag. 673), and therefore also JORDAN and EVERMANN (No. 56, I, pp. 351—52) state that the two species are possibly identical, and even though this may not be proved from the small amount of material here treated, it might yet be that the two most essential distinctive characters, the size of the eye and that of the pectoral fin, vary to such a degree with age and sex as to leave no specific difference, albeit the whole life cycle of the fish, save for the leptocephaline stage, is bathypelagic or near the bottom. As already mentioned, the variation in the size of the eye is very great in the case of *Synaphobranchus pinnatus.*

## *Ilyophidæ.*

### ***Ilyophis brunneus,*** Gilbert.

1892. *Ilyophis brunneus* (Gilbert), Jordan & Davis (No. 55, pag. 670).
1912. „ „ „ Regan (No. 73, pag. 387).

1 specimen, 12 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

This species is thus distinguished from *Histiobranchus*: the gill-openings are separated and crescent-shaped, the branchiostegal rays are curved up behind the operculum, and the teeth on the præmaxillaries form a triangular group with convex base in front, concave sides, and apex behind, followed, after a very slight interval, by a double series of teeth on the vomer.

The head goes 9 times into the total length, hardly 2½ times into the trunk. The eye goes 6½ times into the length of head, and its diameter is ⅓ the length of snout. The gape goes about 1⅔ into the length of head, and the distance of the angle of mouth from the eye is less than the diameter of the latter.

The trunk goes 3½ times into the total length, and the tail is abt. 2½ times as long as the trunk. The dorsal fin commences midway in the trunk, above the fore half of the pectoral. Length of the pectoral fin hardly ¼ that of the head.

LEA gives the number of vertebræ as 132. (No. 60, pag. 18).

| | mm. |
|---|---|
| Total length | 118 |
| Length of head | 13 |
| Length of eye | 2 |
| Length of snout | 6 |
| Length of gape | 8 |
| Eye to angle of mouth | 1.8 |
| Length of pectoral fin | 3.5 |
| Snout to dorsal fin | 16.5 |
| Snout to anus | 33.7 |
| Snout to anal fin | 35.5 |
| Anus to tip of tail | 83 |

Total length: Length of head ..... 9.08
Snout to anus: Head ..... 2.60
Head: Eye ..... 6.5
Snout: Eye ..... 3.00
Head: Gape ..... 1.63
Total length: Trunk : Snout to anus ..... 3.50
Total length: Snout to anal fin ..... 3.32
Tail: Trunk ..... 2.46
Snout to anus: Snout to dorsal ..... 2.04
Head: Pectoral fin ..... 3.72

### *Murænidæ.*

***Muræna helena,*** Lin.

1870. *Muræna helena,* (Lin.), Günther (No. 41, VIII, pag. 96).

1 specimen, 102 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

## SUBORDER HAPLOMI.

### *Scopelidæ.*

***Bathysaurus ferox,*** Günther.

Pl. IV, fig 4.

1878. *Bathysaurus ferox,* Günther (No. 42, pag. 182).
1883. „ *agassizii,* Goode & Bean (No. 35, pag. 215).
1887. „ *ferox,* Günther (No. 43, pag. 181, pl. XLVI, fig. A).
1888. „ *agassizii,* (Goode & Bean), Vaillant (No. 86, pag. 139, pl. X, fig. 1).
1888. „ *ferox,* (Günther), Vaillant (No. 86, pag. 385).
1895. „ *ferox,* (Günther), Goode & Bean (No. 37, pag. 58, figs 65, 66).

1 specimen, 29 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

1 specimen, 26 cm, St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

1 specimen, 37 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

1 specimen, 66 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

3 specimens, 46—63 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

In the stomach of one of the specimens from St. 95 were found two fish of elongated shape.

For further remarks, see the following species.

***Bathysaurus mollis,*** Günther.

1878. *Bathysaurus mollis,* Günther (No. 42, pag. 182).
1887. „ „ „ (No. 43, pag. 183, pl. XLVI, fig. B).
1888. „ *obtusirostris,* Vaillant (No. 86, pag. 136, pl. X, fig. 2, pl. XIV, fig. 3).
1888. „ *mollis* (Günther), Vaillant (No. 86, pag. 385).
1895. „ „ „ Goode & Bean (No. 37, pag. 59).

*Bathysaurus mollis.*

| Total length | mm. | abt. 470 | 630 | 660 |
|---|---|---|---|---|
| Length of body | | 412 | 545 | 575 |
| Height of body at origin of dorsal | | 45 | — | — |
| Height of caudal peduncle | | 21 | — | 32.5 |
| Breadth of body just before pectoral | | 42 | — | — |
| Length of head | | 94 | 138 | 148 |
| Snout to line across centre of eyes | | 26.5 | 50 | 54 |
| Interorbital space | | 17 | 26.5 | 28 |
| Length of snout | | 22 | 42 | 43.5 |
| Horizont. diam. of eye | | 13 | 23 | 23 |
| Snout to dorsal fin | | 147 | 178.5 | 189 |
| Base of dorsal fin | | 74 | 177.5 | 174 |
| End of dorsal to centre of caud. base | | 186 | — | 198 |
| Vertical from end of dorsal to anal | | abt. 58 | — | 32 |
| Dorsal fin rays | | 15 | 17 | 17 |
| Anal fin rays | | 13 | 12 | 12 |
| Pectoral fin rays | | 16 | 15 14 | 15 |
| Ventral fin rays | | 8 | 8 | 8 |
| Scales in lateral line | | abt. 57 | 70 | 73 |
| Station | | 53 | 95 | 88 |

*Bathysaurus ferox.*

| Total length | mm. | 260 | 285 | abt. 370 | „ 460 | „ 620 |
|---|---|---|---|---|---|---|
| Length of body | | 222 | 245 | 320 | 405 | 540 |
| Height of body at origin of dorsal | | 19.5 | — | 31.5 | 50 | — |
| Height of caudal peduncle | | 10 | — | 16.5 | 21.5 | — |
| Breadth of body just before pectoral | | 23 | — | 35 | — | — |
| Length of head | | 61 | 67 | 84.5 | 105 | 145 |
| Snout to line across centre of eyes | | 23 | 24.5 | 30 | 39 | 51 |
| Interorbital space | | 11 | 11 | 16 | 18.5 | 28 |
| Length of snout | | 19.5 | 21.2 | 26 | 32 | 45 |
| Horizont. diam. of eye | | 9.5 | 9.5 | 12 | 17.7 | 22 |
| Snout to dorsal fin | | 74 | 85 | 101 | 130 | 183 |
| Base of dorsal fin | | 70 | 76 | 103 | 130 | 175 |
| End of dorsal to centre of caud. base | | 71 | 79 | 111 | 134 | 178 |
| Vertical from end of dorsal to anal | | — | 16 | 16.5 | 21 | 34 |
| Dorsal fin rays | | 18 | 18 | 18 | 18 | 17 |
| Anal fin rays | | 12 | 12 | 12 | 12 | 12 |
| Pectoral fin rays | | 15 | 15 | 15 | 16 | 15 dext. sin. |
| Ventral fin rays | | 8 | 8 | 8 | 8 | 8 |
| Scales in lateral line | | abt. 73 | abt. 72 | 71 | 71 | 72 |
| Station | | 35 | 25 | 53 | 95 | 95 |

1 specimen, 47 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

*Bathysaurus ferox* and *mollis* are easily distinguished one from another by the following: the snout in *mollis* is oval, making an acute angle in the case of *ferox*; *B. mollis* has a barbel-like appendage between the nostrils,

*B. ferox* a triangular flap; the line from the tip of snout at right angles to the line transversely between the eyes is in the "Michael Sars" specimen of *mollis* about $1^1/_2$ the interorbital distance; in the *ferox* specimens $1^8/_{10}$—$2^1/_{10}$ of the same. In *mollis*, the head goes about $4^1/_3$ times into the length of body; in *ferox* $3^2/_3$—4 times. The dorsal fin is shorter in *mollis* than in *ferox*, its base in *mollis* being equal to half its distance from tip of snout, and going abt. $5^1/_2$ times into length of body, whereas in *ferox*, its base is about equal to its full distance from tip of snout, going 3—$3^1/_3$ times into length of body. In *mollis*, the anal fin is situate a good way behind the dorsal; in *ferox*, close behind; in *mollis*, there is an adipose fin on the back, behind the vertical for the anal fin; in *ferox* this is lacking. The lateral line in *mollis* terminates at the base of the caudal fin, and numbers abt. 57 scales, whereas in *ferox*, it extends out into the ventral portion of the caudal fin, and has 70—73 scales. The right lobe of the liver is very large in *ferox*, but lacking in *mollis*.

In both, a median ray in the pectoral fin is prolonged, this being, in *mollis*, the 6th from above, in *ferox* the 7th from above.

*Bathysaurus ferox.*

| Total length | Length of body: Height of body | Height of body: Height of caudal peduncle | Length of body: Breadth of body | Length of body: Length of head | Snout to line across eyes: Interorbital space | Length of head: Horiz. diam. of eye | Length of body: Base of dorsal | Snout to dorsal: Base of dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | |
| 260 | 11.40 | 1.95 | 9.66 | 3.64 | 2.09 | 6.43 | 3.17 | 1.06 | 35 |
| 285 | — | — | — | 3.66 | 1.93 | 7.05 | 3.22 | 1.12 | 25 |
| abt. 370 | 10.15 | 1.91 | 9.15 | 3.79 | 1.87 | 7.05 | 3.11 | 0.98 | 53 |
| „ 460 | 8.10 | 2.32 | — | 3.86 | 2.10 | 5.94 | 3.12 | 1.00 | 95 |
| „ 620 | — | — | — | 3.72 | 1.82 | 6.60 | 3.08 | 1.05 | 95 |
| „ 630 | — | — | — | 3.95 | 1.89 | 6.00 | 3.07 | 1.01 | 95 |
| „ 660 | — | — | — | 3.89 | 1.93 | 6.44 | 3.30 | 1.09 | 88 |

*Bathysaurus mollis.*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| abt. 470 | 9.16 | 2.14 | 9.80 | 4.38 | 1.56 | 7.24 | 5.57 | 1.99 | 53 |

***Bathypterois longipes,*** Günther.

1887. *Bathypterois longipes,* Günther (No. 43, pag. 188, pl. XLVIII, fig. A).
1895. „ „ (Günther), Goode & Bean (No. 37, pp. 66, 511, fig. 76).

2 specimens, 19—20 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

D. 13, A. 10, P. 2 + 9, V. 2 + 7, (the innermost is small), lat. line 55.

Eye very small, hardly $^1/_{15}$ length of head. The dorsal fin is situate slightly in rear of the ventrals, about the middle of the body, it terminates above the 5th ray of the anal, and its base is hardly $^1/_6$ the length of body. The upper one of the two prolonged rays in the pectoral is longer and stronger than the other, and extends out over the caudal fin; its length being equal to the distance from point of mandible to end of longest ray in caudal fin. The two outermost rays of the ventral fin extend beyond the anal fin; their points are enveloped in a soft integument common to both. GÜNTHER states "they are articulated to the end and without the soft pads" (No. 43, pag. 188); from the "Michael Sars" specimens, however, it is seen that this soft skin easily comes away. The caudal fin also has in its ventral part two prolonged rays with thickened ends. Both fishes have an adipose fin.

| | mm. | mm. |
|---|---|---|
| Total length without prolonged caudal rays | 185 | 195 |
| Length of body | 143 | 153 |
| Length of head | 38.0 | 38.5 |
| Length of eye | 2.5 | 2.5 |
| Tip of mandible to dorsal fin | 67 | 72 |
| Dorsal fin to caudal base | 55 | 60 |
| Base of dorsal fin | 23 | 25 |
| Tip of mandible to ventral fin | 55 | 60 |

***Bathypterois dubius,*** Vaillant.

1888. *Bathypterois dubius,* Vaillant (No. 86, pag. 124, pl. IX, XII, XIV, XV).
1895. „ „ (Vaillant), Goode & Bean (No. 37, pag. 64, fig. 74).
1896. „ „ (Vaillant), Collett (No. 13, pag. 105, pl. IV, fig. 19).
1911. „ „ (Vaillant), Zugmayer (No. 92, pag. 16).
1919. „ „ (Vaillant), Roule (No. 79 c, pag. 34).

1 specimen, 13 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

10 specimens, 16—19 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

D. I, 14, A. 9, V. 2 + 6, P. 2 + 9—11, lat. line abt. 58—60.

| | | |
|---|---|---|
| Total length | 193 | mm. |
| Length of body | 168 | „ |
| Height of body at dorsal | 20.5 | „ |
| Proportion to length of body | 8.2 | |
| Length of head | 34.5 | „ |
| Proportion to total length | 5.6 | |
| Proportion to length of body | 4.87 | |

| | | |
|---|---|---|
| Length of snout (from symphysis of mandible to the eye) | 12 | mm. |
| Proportion to length of head | 2.87 | |
| Interorbital space | 12.5 | „ |
| Snout to anus | 83 | „ |
| Snout to origin of dorsal | 70.5 | „ |
| End of dorsal to base of caudal | 70.5 | „ |
| End of dorsal to adipose fin | 30 | „ |

***Benthosaurus grallator,*** Goode & Bean.

1895. *Benthosaurus grallator,* Goode & Bean (No. 37, pag. 62, fig. 73).

2 specimens, 32—41 cm., St. 53, 9/6, N. 34° 59′, W. 33° 1′, 2865 m., yellow hard clayish mud.

D. 13, A. 13, V. 7, P. 9, lat. line abt. 60.

These two fish agree so exactly with the specimens from the "Blake" and the "Albatross" that only a slight remark need here be made.

The height of the caudal peduncle goes $4^1/_4$—$4^1/_2$ times into its length, reckoned to the anal fin; $5^1/_3$—$5^1/_2$ times into the same when reckoned to the dorsal fin; not, as in the American specimens, $6^1/_2$ times.

The length of the head in these two specimens is to length of body as 1 : 3.29—3.5. The operculum, like the præoperculum, is scale-covered. The lateral line continues out into the upper part of the caudal fin with 3—4 scales. The extremity of the prolonged ray in the ventral fins and caudal fin is furnished with soft skin.

| | mm. | mm. |
|---|---|---|
| Total length to the perpendic. of tip of upper caudal lobe | 320 | abt. 407 |
| Length of body | 263 | 346 |
| Greatest height of body | 35 | 51 |
| Height of caudal peduncle | 17.5 | 25 |
| Anal to base of caudal | 78 | 106 |
| Dorsal to base of caudal | 97 | 134 |
| Length of head | 80 | 99 |
| Length of snout | 24 | 30 |
| Interorbital space | 22 | 27.5 |
| Length of upper jaw | 50 | 70 |
| Length of postorbital part of head | 53 | 66 |
| Snout to dorsal | 130 | 166 |
| Length of body: Height of body | 7.52 | 6.78 |
| Height of body: Height of caudal peduncle | 2.00 | 2.04 |
| Anal to caudal: Height of caudal peduncle | 4.45 | 4.24 |
| Dorsal to caudal: Height of caudal peduncle | 5.54 | 5.36 |
| Length of head: Height of body | 2.28 | 1.98 |
| Length of body: Length of head | 3.29 | 3.50 |

**Bathymicrops,** n. g.

Eyes vestigeal, covered by scales; dentition feeble.

***Bathymicrops regis,*** n. sp.

Pl. V, figs. 1—3.

1 specimen, 11 cm., St. 48, 31/5, N. 28° 54′, W. 24° 14′, abt. 5000 m.

D. 11, A. 14, P. 9, V. 8, lat. line abt. 67.

The fish is of an elongated shape, the height going 19 times into the length. Head flat, body rounded, the belly, however, flat between the ventrals, caudal peduncle compressed. The colour seems now for the most part to have disappeared, but must, as far as can be seen, have been greyish brown, darkest between the head and the ventral fins, especially on the belly. Behind the ventral fins there are dark transverse bands, one at the level of the dorsal fin, one between this and the anal, one at the commencement of the anal fin, and another at its end, one between this and the caudal fin, and one at the base of the caudal itself. A colour pattern of this sort has not generally been observed in deep-sea fish, but may be seen, however, in GÜNTHER's figure of a young *Bathysaurus mollis.* (No. 43, pl. XLVI, fig. B′).

Length of head abt. $^1/_6$ that of body. Pectoral fins situate immediately behind the head, ventrals at commencement of second third of the body; the anus between them. The dorsal begins slightly in front of the middle of body, and the origin of the anal roughly indicates the commencement of the last third of the body. Distance from anal fin to middle of base of caudal fin, or length of the caudal peduncle, is $^1/_5$ the length of body. The lateral line had probably 67 scales; as, however, the scales have fallen off, nothing further can be said with regard to this, or to the scale covering generally.

The head is flat. The lower jaw projects out beyond the upper. The mouth is very large, extending throughout almost the entire length of head. The gill aperture also is very broad, so that the posterior margin of the gill-cover describes a big arc from the neck backwards. The eye is inconsiderable, and lies entirely beneath the scales, which cover the upper part of the head. Distance from point of snout to eye is $^1/_4$ length of head. Nostrils slightly nearer the eye than the point of snout. The upper part of the mouth consists of vomer and præmaxilla, the vomer curves up between right and left groups of teeth, so as to receive the upward curving point of the lower jaw. The vomer, præmaxilla and mandible are furnished with a bristly arrangement of very small, sharp teeth. Above the præmaxilla lies the maxilla, a mere splinter of bone, quite thin, with a slight club-shaped expansion at the rear.

| | | |
|---|---|---|
| Total length | 105 | mm. |
| Length of body | 94.5 | „ |
| Height of body | 5 | „ |
| Proportion to length of body | 18.90 | |
| Length of head | 16 | „ |
| Proportion to length of body | 5.90 | |
| Symphysis of mandible to ventrals | 28 | „ |
| Proportion to length of body | 3.37 | |
| Symphysis of mandible to anus | 33 | „ |
| Symphysis of mandible to dorsal | 38.2 | „ |
| Proportion to length of body | 2.47 | |
| Symphysis of mandible to anal | 61 | „ |
| Proportion to length of body | 1.55 | |
| Anal to caudal | 19 | „ |
| Proportion to length of body | 4.96 | |
| Length of snout | 4 | „ |
| Interorbital space | 2.5 | „ |

### *Stephanoberycidæ.*

***Stephanoberyx gillii,*** Goode and Bean.

1895. *Stephanoberyx gillii,* Goode & Bean (No. 37, pag. 187, fig. 206).

2 specimens, 12—13 cm., St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

1 specimen, 15 cm., St. 53, 8-9/6, N. 34° 59′, W. 33° 1′, 2615—2865 m., yellow hard clayish mud.

D. 11, A. 10, P. 13, V. 5.

| Total length | Length of body | Height of body | Length of head | Length of snout | Horiz. diam. of eye | Postorbital part of head | Length of upper jaw | Distance between head and anal |
|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | |
| 123 | 105 | 27 | 37 | 11 | 9 | 18.2 | 20 | 34 |
| 132 | 109 | 27 | 39 | 10 | 9.5 | 20.5 | 21 | 35.5 |
| 146 | 123 | 29 | 42 | 12 | 10.5 | 21 | 23.5 | 39.5 |

| Total length | Length of body: Height of body | Length of body: Length of head | Length of head: Length of snout | Length of head: Horiz. diam. of eye |
|---|---|---|---|---|
| mm. | | | | |
| 123 | 3.89 | 2.84 | 3.36 | 4.11 |
| 132 | 4.04 | 2.80 | 3.90 | 4.10 |
| 146 | 4.25 | 2.93 | 3.50 | 4.00 |

## SUBORDER HETEROMI.

### *Halosauridæ.*

***Halosauropsis macrochir,*** Günther.

Pl. IV, fig. 7.

1887. *Halosaurus macrochir,* Günther (No. 43, pag. 237, pl. LIX, fig. A).
1888. „ „ (Günther), Vaillant (No. 86, pag. 170, pl. XVI, figs 2—2 e).
1895. *Aldrovandia macrochira,* (Günther), Goode & Bean (No. 37, pag. 133, figs 155, 155 a).
1896. *Halosauropsis macrochir,* (Günther), Collett (No. 13, pag. 146, pl. V, figs 23, 23 b).
1911. „ „ (Günther), Zugmayer (No. 92, pag. 12).

5 specimens, 44—60 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

2 specimens, between 20 and 30 cm., St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

7 specimens, 30—58 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

1 specimen, 39 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

3 specimens, 56—62 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

The *Halosauropsis* taken here correspond to COLLETT's description of *macrochir* but the measurements exhibit some little variation. As regards the scales of the lateral line, however, it should be noted that the number of these in front of the anus is about 30 — from 27 to 32 have been counted — and that the shape of the skin flap is somewhat different from that shown by COLLETT (No. 13, pl. V, fig. 23 b). The posterior margin of the pouch curves out ventrally (figs 14 & 15). The posterior

Fig. 14. *Halosauropsis macrochir,* Günth. 58 cm. Lateral line before anus (× 2).

Fig. 15. *Halosauropsis macrochir,* Günth. 58 cm. Lateral line behind anus (× 1¾).

margin is entirely black pigmented, and just covers the light organ when pressed in to the body, presumably when the fish swims forward, to avoid some enemy for instance. The ventral margin is also black pigmented, but the middle part, and the membrane as far at its foremost attachment, are transparent while a crescent-shaped part in the front is perforated, so that the light can, when the membrane is expanded, pass from one pouch to the other, and the water and any possible secretion can then also pass through. The light organ itself is seen to be divided into three parts; a point in the centre, and above and below a triangle with base towards the central point.

| Total length | Length of body | Height of body | Length of head | Length of part of snout before mouth | Length of snout | Horiz. diam. of iris | Vertical diam. of eye | Interorbital space | Breadth of frontalia between eyes | Length of post-orbital part of head | Snout to anus | Snout to dorsal | Snout to ventral | Gill-opening to ventral | Ventral to anus | Number of rays in dorsal | Number of rays in pectoral | Number of rays in ventral | Number of scales in lat. line before anus | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| abt. 24 cm. | Tail broken, regenerated | 15 | 40 | 5.6 | 17.5 | 4.8 | 2.5 | 7 | 6 | 18 | 99 | 71.5 | 67 | 30.5 | 32.5 | 12 | 12 | 9 | abt. 27-30 | 35 |
| 360 mm. | 340 | 20 | 47.5 | 7 | 20 | 6 | 3.5 | 9.7 | 8 | 22 | 123 | 87.5 | 82 | 36.5 | 42 | 12 | 11 | 9 | abt. 28 | 53 |
| 390 „ | — | 23.5 | 53 | 7 | 21 | 6.1 | 4.2 | 12.5 | 8.7 | 24.5 | 147 | 105 | 102 | 49 | 49 | 12 | 12 | 9 | abt. 30 | 88 |
| 440 „ | — | 29 | 60 | 9.5 | 27.5 | 6.7 | 4 | 13 | 10 | 27.5 | 155 | 111 | 108 | 50 | 50 | 13 | 11 | 9 | — | 25 |
| 44 cm. | Tail broken | 31 | 68 | 10 | 30.5 | 7.5 | 5 | 16 | abt. 12 | 31 | 184.5 | 131 | 121 | 56 | 64.5 | 12 | 12 | 9 | 31 | 53 |
| 550 mm. | — | 39 | 80 | 10.5 | 34 | 9 | 6 | 18 | 14 | 35 | 213 | 153 | 143 | 63 | 73 | 13 | 13 | 9 | — | 25 |
| 600 „ | — | 45 | 85 | 11 | 35.5 | 10 | 6 | 21 | 16 | 41 | 233 | 165 | 160 | 78 | 74 | 12 | 12 | 9 | 31 or 32 | 25 |
| 580 „ | 533 | 38 | 87 | 11.5 | 37 | 9.8 | 6.6 | 21.5 | 16.5 | 42 | 227 | 158 | 152 | 71 | 78 | 12 | 12 | 9 | 29 | 25 |
| 595 „ | Outermost part of caudal rays broken | 41 | 87 | 11 | 37 | 10 | 6.5 | 22 | 17 | 39 | 236 | 169 | 165 | 76 | 74 | 12 | 12 | 9 | abt. 30 | 25 |
| bt. 60 cm. | Tail broken | 43 | 91 | 13 | 41 | 11 | 7 | 23.5 | 20 | 44 | 256 | 177 | 172 | 85 | 86 | 11 | 11 | 9 | 30 | 95 |

| Total length | Total length: Height of body | Length of body: Height of body | Total length: Length of head | Length of body: Length of head | Length of snout: Part of snout before mouth | Length of head: Length of snout | Length of head: Horiz. diam. of iris | Horiz. diam. of iris: Vertical diam. of eye | Breadth of frontalia: Vertical diam. of eye | Postorbital part of head: Horiz. diam. of iris | Snout to anus: Length of head | Snout to dorsal: Length of head | Ventral to anus: Gill-opening to ventral | Snout to dorsal: Snout to ventral | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| abt. 24 cm. | 16.0 | — | 6.0 | — | 3.13 | 2.28 | 8.34 | 1.92 | 2.40 | 3.75 | 2.48 | 1.79 | 1.07 | 1.07 | 35 |
| 360 mm. | 18.0 | 17.0 | 7.58 | 7.16 | 2.86 | 2.35 | 7.92 | 1.72 | 2.28 | 3.66 | 2.62 | 1.86 | 1.15 | 1.07 | 53 |
| 390 „ | 16.6 | — | 7.37 | — | 3.00 | 2.52 | 8.70 | 1.45 | 2.07 | 4.18 | 2.78 | 1.98 | 1.00 | 1.03 | 88 |
| 440 „ | 15.2 | — | 7.35 | — | 2.90 | 2.18 | 8.96 | 1.68 | 2.50 | 4.23 | 2.58 | 1.85 | 1.00 | 1.03 | 25 |
| 44 cm. | 14.2 | — | 6.48 | — | 3.05 | 2.22 | 9.07 | 1.50 | 2.40 | 4.13 | 2.72 | 1.93 | 1.15 | 1.08 | 53 |
| 550 mm. | 14.1 | — | 6.88 | — | 3.24 | 2.35 | 8.9 | 1.50 | 2.33 | 3.89 | 2.66 | 1.92 | 1.16 | 1.07 | 25 |
| 600 „ | 13.3 | — | 7.06 | — | 3.23 | 2.40 | 8.5 | 1.67 | 2.67 | 4.10 | 2.74 | 1.94 | 0.95 | 1.03 | 25 |
| 580 „ | 15.3 | 14.0 | 6.67 | 6.10 | 3.22 | 2.35 | 8.89 | 1.48 | 2.50 | 4.29 | 2.61 | 1.82 | 1.10 | 1.04 | 25 |
| 595 „ | 14.5 | — | 6.84 | — | 3.36 | 2.35 | 8.7 | 1.54 | 2.62 | 3.90 | 2.72 | 1.94 | 1.03 | 1.02 | 25 |
| abt. 60 cm. | 14.0 | — | 6.60 | — | 3.16 | 2.22 | 8.27 | 1.57 | 2.86 | 4.00 | 2.82 | 1.95 | 1.01 | 1.03 | 95 |

***Halosaurus johnsonianus,*** Vaillant.

1888. *Halosaurus johnsonianus,* Vaillant (No. 86, pag. 181, pl. XV, figs 2—2 d).
1896. „ „ (Vaillant), Collett (No. 13, pag. 143, pl. IV, fig. 20).

16 specimens, abt. 20—39 cm., some of them with regenerated caudal, St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

| Total length | Length of body | Height of body | Length of head | Length of preoral part of snout | Length of snout | Length of entire orbita | Horiz. diam. of iris | Vert. diam. of eye | Interorbital space | Breadth of frontalia between eyes | Length of postorbital part of head | Snout to anus | Snout to dorsal | Snout to ventral | Gill-opening to ventral | Ventral to anus | Dorsal rays | Pectoral rays | Ventral rays | Scales in lat. line before anus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 335 mm. | 304 Probably regenerated | 14.5 | 45 | 8 | 18 | 10.5 | 7 | 5 | abt. 7 | 4.2 | 18 | 130 | 88 | 78 | 34 | 55 | 10 | 13 | 8 | 55 |
| 355 „ | 327 Probably regenerated | 16.5 | 45.5 | 7 | 20 | 10.5 | 7 | 6 | 7 | abt. 4.5 | 20 | 133 | 95 | 82 | 37 | 51 | 11 | 13 | 9 | abt. 52 |
| 38 cm. | — | 18 | 52 | 9 | 21 | 12 | 7.5 | 6 | abt. 7.5 | 4.2 | 21 | 154 | 108 | 92 | 40 | 64 | 11 | 14 | 9 | abt. 52 |

| Total length | Total length: Height of body | Length of body: Height of body | Total length: Length of head | Length of body: Length of head | Length of snout: Preoral part of snout | Length of head: Length of snout | Length of head: Length of orbita | Length of head: Horiz. diam. of iris | Length of orbita: Vert. diam. of eye | Horiz. diam. of iris: Vert. diam. of eye | Interorbital space: Vertical diam. of eye | Breadth of frontalia: Vertical diam. of eye | Vertical diam. of eye: Breadth of frontalia | Postorbital part of head: Length of orbita | Postorbital part of head: Horiz. diam. of iris | Snout to anus: Length of head | Snout to dorsal: Length of head | Snout to ventral: Length of head | Ventral to anus: Gill-opening to ventral | Snout to dorsal: Snout to ventral |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 335 mm. | 23.1 | 21.0 | 7.45 | 6.76 | 2.25 | 2.50 | 4.28 | 6.44 | 2.10 | 1.40 | 1.40 | 0.84 | 1.19 | 1.71 | 2.57 | 2.89 | 1.95 | 1.73 | 1.62 | 1.13 |
| 355 „ | 21.5 | 19.8 | 7.80 | 7.20 | 2.86 | 2.25 | 4.33 | 6.43 | 1.75 | 1.17 | 1.17 | 0.75 | 1.33 | 1.91 | 2.86 | 2.92 | 2.09 | 1.80 | 1.38 | 1.16 |
| 38 cm. | 21.1 | — | 7.31 | — | 2.34 | 2.48 | 4.33 | 6.94 | 2.00 | 1.25 | 1.25 | 0.76 | 1.31 | 1.75 | 2.80 | 2.96 | 2.08 | 1.77 | 1.60 | 1.18 |

## *Notacanthidæ.*

### *Notacanthus sp.*

Pl. IV, fig. 1.

1 specimen, 64 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

Greatest height of body between pectoral and ventral fins $6^1/_5$ times in total length, $2^3/_4$ times in length from point of snout to anus. The head, and the body itself in front of the anus, are of more or less equal height, the proportion between height of head just behind the eye and height of body at anus being as 1 : 1.18. The fish is highly compressed, breadth at the pectorals only a little over $^1/_3$ the height there.

Length of head goes $6^1/_5$ times into total length and $2^3/_4$ times into length in front of anus, like the height of body. Greatest height at the isthmus goes $3^2/_3$ times into distance from point of snout to anus. Length of snout abt. $^1/_4$ of head, that of the eye $^1/_6$; the part of the snout which lies in front of the nostrils is about half as long as the entire snout, possibly a little more. The eye is slightly oval, and lies barely its own height below the upper contour of the head. Interorbital space $1^1/_3$ the horizontal diameter of the eye. Postorbital portion of the head is $2^2/_3$ length of snout. The symphysis of the upper jaw lies below the nostrils, that of the lower jaw behind them. The upper jaw extends to a point beneath the posterior margin of the pupil, and has, like the other *Notacanthus*, a recurvate spine. The præmaxilla has on either side 28 teeth in a row. The mandible has on either side innermost a series of 21 closely set teeth, and outside these, smaller teeth, in one row at the back, farther forward in two, then in three and right out at the symphysis irregularly grouped. On the palatine, the den-

tal armature presents mostly a villiform appearance. There are three more or less regular series, only two, however, at the extreme posterior part; the innermost row contains about 20 teeth, which are not larger than those in the two other series.

The membranes of the gill-cover meet ventrally in front of the upper point of the branchial aperture at a distance behind the eye equal to 1¼ times the diameter of the latter.

There are 9 dorsal spines, and also, connected with the ninth, a flexible ray imbedded in thick skin. Distance from point of snout to the foremost dorsal spine is 2½ times the length of head, going hardly 2½ times into total length. The first spine is set approximately above the middle of the innermost ray in the ventral fin, the third slightly in front of the anus, and the fourth above the origin of the anal fin. These dorsal spines take up altogether a space equal to a little more than the length of head.

The anal spines are 15 in number, the first, just behind the anus, is very small and nearly hidden in the skin, the six last are set behind the dorsal spines, and show traces of articulation. Number of soft rays in anal fin 125—130.

The pectoral fins have 17 rays; their distance from the gill-cover answers about to the vertical diameter of the eye; the distance from their point to the vertical of the origin of the ventral fins is about equal to the length of the postorbital portion of the head.

The ventral fins are connected; they have three spines and seven soft rays. The two first spines are small, especially the first; the third is bifurcate. Their distance from point of snout goes 2⅔ times into total length, the distance from their point to the anus is roughly equal to the length of their innermost ray.

The caudal fin has 4 or 5 rays; whether it has arisen by regeneration after loss of the tip of the tail cannot be seen. Above the caudal fin, the point of the tail continues out, edged dorsally by a fold which may be followed forward over the tail for a distance equal to length of the postorbital portion of the head; *i. e.* along the last 40 rays or so of the anal fin.

The lateral line forms an arc above the pectoral fin, but only reaches the middle of the body about the beginning of the soft rayed part of the anal fin. It is tube-shaped, with distinct pores, the latter becoming fainter out towards the tail; 86 were counted to the soft-rayed part of the anal fin.

The lateral line continues on the head in pores, some running out above the eye to the upper part of the snout, others beneath the eye to the upper jaw, and others again down over the præoperculum to the mandible. The two last-named series of pores terminate in front of the upper jaw and behind the symphysis of the mandible in a rich field of pores covered with a number of soft papillæ, which render the part in question quite furry.

Head and body are covered with small scales. From the eye to the uppermost point of the branchial aperture there are abt. 45 scales; an oblique row rearward from the lateral line to the foremost dorsal spines gives abt. 30, and to the anus abt. 45 scales.

---

This *Notacanthus* resembles *N. analis*, GILL, (GOODE & BEAN No. 37, pag. 165, figs. 184, 191 a & b.) in having the height of body equal to length of head; in all the other species, the height of body is considerable less than the length of head.

The shape of the body is, however, not the same as in *N. analis*, being here almost equally high at pectorals and ventrals, whereas in *N. analis*, the height at the latter is greater than at the former. In the *Notacanthus* from the cruise of the "M. S." in 1910, the proportion between height of body at pectoral fin and that at ventral is as 1 : 1.02; in *analis* as 1 : 1.18.

Besides the number of dorsal and anal spines, which can doubtles vary somewhat, there are also other features in which the two species differ. Thus the dorsal spines here first commence above the middle of the innermost ventral ray, whereas in *analis*, the first dorsal ray is set in front of the ventral fin; the snout is mucous, in *analis*, not swollen; the interorbital space ⅛ greater than the longitudinal diameter of the eye, in *analis* less than the same. On the other hand, the height of body is in both species equal to abt. ⅓ the length to the anus, the snout 1½ times the length of eye, and the distance of the ventral fins from the anus half their length. With regard to the teeth in *analis*, nothing is stated; in the arrangement of these, the *Notacanthus* from "M. S." 1910 mostly resembles *N. phasganorus* and *nasus*.

With regard to *phasganorus*, GOODE & BEAN (No. 37, pag. 168, fig. 186) writes:—"Teeth in upper jaw blunt, accicular, set side by side like the teeth of a comb, about 32 on each side. In lower jaw shorter, slenderer and in double rows. Villiform teeth upon palatines".

This does not exactly apply to the arrangement of teeth in the *Notacanthus* from "M. S." 1910, but answers in some degree thereto. The appearance was as follows: In upper jaw 28 teeth on either side; in lower jaw up to 4 rows in front, on the palatine three rows could be distinguished, but the term villiform fits well enough, as the teeth were of about equal size, and the serial arrangement not altogether regular. The number of pectoral rays, 17, also agrees. The height of body, however, is

less, and the head shorter, in *phasganorus*, going only 9 and $7^1/_3$ times respectively into total length, as against 6 times for the *Notacanthus* from "M. S." 1910. Furthermore, the interorbital distance is greater, being longer than the the snout, twice as great as the eye, and $^1/_4$ the head, while in the specimen from the "M. S." 1910, it is less than the snout, only $1^1/_3$ as long as the eye, and goes $4^1/_2$ times into the length of head. The space taken up by the dorsal spines is in *phasganorus* twice as long as the head, in *Notacanthus* from "M. S." 1910, of same length as the head. And finally, *phasganorus* has "ventrals closely adjacent, separated by narrow groove" whereas in *Notacanthus* "M. S." 1910 they are confluent.

With regard to the teeth in *Notacanthus nasus*, LÜTKEN writes as follows (No. 63, pag. 149). In the præmaxilla: "abt. 40 on either side", and further, "the teeth of the lower jaw . . . are set in double, at the foremost part possibly triple, row, but the outer teeth are smaller than those of the innermost or main row".

"The teeth of the palatine . . . have the character of common cardiform teeth; they are set in a double or triple row in front, decreasing backwards towards the corners of the mouth, like that of the teeth in the jaw" [1]).

CUVIER and VALENCIENNES write (No. 18, vol. VIII, pag. 468):—

"Les dents de la mâchoire supérieure, sur une seule rangée, serrées, cylindriques, un peu aplaties sont au nombre d'environ trente de chaque côté; celles de la mâchoire inférieure, plus grêles, pointues, un peu crochues au bout, sont sur trois ou quatre rangées en avant; sur une seule en arrière. Les dents palatines, semblables à celles de la mâchoire inférieure, sur trois ou quatre rangées en avant, se réduisent par degrés á une seule vers l'arrière."

SÆMUNDSSON writes (No. 84, pag. 21):—"On the intermaxillary there have been (on either side) 36 teeth in a single series, but they have all disappeared, as also in the mandible, where there have been three rows, with 30 teeth in the innermost, 22 in the middle row, and 7 in the outermost. The palatine and vomer show no traces of dentition."

As will be seen, then, the principal difference as compared with the *Notacanthus* from "M. S." 1910 is the greater number of teeth in the intermaxillary, abt. 40 as noted by LÜTKEN for the specimen of 91 cm. and 36 according to SÆMUNDSSON. CUVIER and VALENCIENNES, however, state only 30 in the specimen of 85 cm. The fish from "M. S." is 64 cm. long, and has, as mentioned, 28 teeth. For the mandible, SÆMUNDSSON records 30 in the innermost series, as against 21 in the "M. S." specimen.

In *Notacanthus nasus*, however, the height of body goes, according to LÜTKEN, 11.4 times into the length, and according to CUVIER and VALENCIENNES 12 times, though both these specimens should, from their greater size, be higher than the fish from the "M. S." 1910, where the height of body is contained only $6^3/_4$ times in the length. SÆMUNDSSON also gives the height of body in *N. nasus* as less than in the *Notacanthus* from "M. S." 1910, the greatest height going 13 times into the total length, despite the fact that the tip of the tail is broken off.

The head also, according to the statements of LÜTKEN, SÆMUNDSSON and CUVIER and VALENCIENNES, is somewhat smaller than in the present case; LÜTKEN gives 7 times, SÆMUNDSSON $7^1/_3$, CUVIER and VALENCIENNES 8 times into total length, whereas the *Notacanthus* from "M. S." 1910 has a head going $6^1/_5$ times into total length. According to SÆMUNDSSON, the head goes $3^1/_4$ times into distance from point of snout to anus, as against $2^3/_4$ times in the "M. S." fish.

The snout in *N. nasus* is described as longer. LÜTKEN states that the distance from foremost nostril to point of snout is twice the ocular diameter, whereas in the present specimen, the entire length of the snout is only $1^1/_2$ times the diameter of the eye.

JORDAN and EVERMANN (No. 56, part I, pag. 615) state, after HILGENDORF, that the snout is twice to three times as long as the eye. According to SÆMUNDSSON, the proportion between length of snout and length of eye is as 1 : 3.57; in the *Notacanthus* from "M. S." 1910, it is 1 : 4.16.

On the other hand, the present specimen appears to agree with *N. nasus* as regards the number of pectoral rays. LÜTKEN gives 14—16, CUVIER and VALENCIENNES 16 or 17, HILGENDORF 19 and SÆMUNDSSON 14. The *Notacanthus* from "M. S." 1910 has 17 rays.

Compared with *N. bonapartii* and the *N. mediterraneus* and *sexspinis* considered by COLLETT (No. 14 b, pag. 47, 50), as synonymous therewith, our *Notacanthus*

---

[1]) While on a visit to Copenhagen, I had an opportunity of examining the *Notacanthus nasus* described by LÜTKEN in 1877 and would now add the following remarks, concerning the specimen in question.

The teeth present a great difference from those of the *Notacanthus* "M. S." 1910, the shape being distinctly as stated by LÜTKEN (No. 63. pag. 149) "slightly S-shaped . . . with a tendency to the lancet-shape." The foremost palatine teeth are abt. 3 mm. long, resembling those of the jaws, though not "S-shaped", and differ widely from the almost villiform arrangement of the teeth on the palatina in *N.* from "M. S." 1910. As LÜTKEN writes, "the palatine teeth resemble mostly those of the lower jaw, but are smaller and more slender."

As will be seen from the proportions given for height of body as to total length, the shape of the body in *N. nasus* is very different from that in the *N.* from "M. S." 1910.

from the "Michael Sars" 1910 differs in regard to the arrangement of teeth on præmaxilla, mandible and palatine, where the former are stated as having only a single row of close-set teeth. LÜTKEN hints at the possibility that RISSO's *N. bonapartii* is merely a young *nasus*. In this connection he states, *inter alia* (No. 63, pag. 153): "The small number of teeth may doubtless also be explained as due to the presumable youth of the specimen." And as regards our present *Notacanthus,* it is possible that the small teeth outside the main row of the mandible may have developed later, with increasing age, but in the case of the teeth on the palatine, there can be no question of any such resemblance to *N. bonapartii,* as the rows of teeth are alike, and there is no main series, whereas in *bonapartii,* the teeth of the palatine correspond entirely to those of the mandible. True, RISSO (No. 78, pag. 377) states: "Dents palatines disposées sur deux rangées", but in the specimens examined on the cruise of the "Michael Sars" in 1902, only one row was found, and no trace of others. In *N. bonapartii* also, the height of body is less than in our present specimen, going, according to COLLETT and HOLT & BYRNE (No. 47, pag. 16) only 9—10 times into total length, and $3^1/_2$—$4^1/_2$ times into length in front of anus, as against $6^1/_5$ and $2^3/_4$ times respectively. COLLETT's and HOLT & BYRNE's specimens are, it is true, smaller, 26—46 cm. and may possibly therefore be somewhat more slender.

According to COLLETT and HOLT & BYRNE, the eye in *N. bonapartii* is abt. $^1/_5$ the length of head, as also stated by VAILLANT (No. 86, pag. 326) for *N. mediterraneus;* in *N. sexspinis,* GÜNTHER (No. 43, pag. 243) gives the eye as $^1/_6$ of the head, as is also the case with the specimen here in question.

RISSO counts 16 rays in the pectoral fins; COLLETT and HOLT & BYRNE 14—15. VAILLANT gives 12 for *N. mediterraneus,* GÜNTHER, likewise 12 for *sexspinis.* The *Notacanthus* from the "M. S." 1910 has 17. Otherwise, there is considerable resemblance between the *N. bonapartii* and the *Notacanthus* from "M. S." 1910.

*Notacanthus annectens* can, HOLT and BYRNE (No. 47, pag. 17) opine, be included under *N. bonapartii;* it may therefore be presumed that the palatine teeth here are set in a single row, though this is not mentioned by BOULENGER (No. 7 b, pag. 167, pl. XI). In this species also, the height of body is but small, going $3^3/_4$ times into the distance from point of snout to anus. The eye is $^1/_5$ the length of head, as in *N. bonapartii.* It differs also from the present *Notacanthus* in having the first dorsal spine situate above the anus and not, as here, the third; also in respect of the ventral fins, which reach to the anus and have only two spines, whereas in the *Notacanthus* from "M. S." 1910 the ventral fins terminate in front of the anus, at a distance therefrom equal to the length of their innermost ray; they have also three spines.

With regard to the palatine teeth in *moseleyi,* GOODE & BEAN (No. 37, pag. 169, figs. 187, 193), nothing is stated. Here also the height of body goes about 9 times into the total length and the eye 5 times into the length of head. Furthermore, the branchial membranes meet under the head, vertically below the upper point of the branchial aperture, whereas in the *Notacanthus* from "M. S." 1910, they meet in front of this point. The pectoral fin has only 9 rays, and the ventral only one spine in addition to 7 soft rays.

*Notacanthus spinosus* has, according to GARMAN (No. 26, pag. 301, pl. L', fig. 4), a height of body equal to $^1/_{10}$ of the total length. The snout is $1^1/_4$ times as long as the eye, which is $^2/_{11}$ of the length of head, and equal to the interorbital distance, whereas the snout in the *Notacanthus* from "M. S." 1910 is $1^1/_2$ times as long as the eye, $^2/_{12}$ of the length of head, and the interorbital distance is $1^1/_3$ times the length of the eye. It differs from all other species of *Notacanthus* in the great number of teeth in the jaws, about fifty on the upper and fifty two on the lower jaws. The teeth both on jaws and palatines are in one row.

Furthermore, the dorsal spines commence one head's length behind the gill-cover, whereas the first dorsal spine in the *Notacanthus* from "M. S." 1910 is set at a distance from the head equal to $1^1/_2$ times the length of the latter.

From the foregoing, then, it is clearly evident that further material of *Notacanthus* is much to be desired, or at any rate, a direct comparison of the specimens hitherto taken.

| | | |
|---|---|---|
| Total length | abt. 644 | mm. |
| Length of body | abt. 633 | „ |
| Snout to anus | 287 | „ |
| Height of body between pectorals and ventrals | 104 | „ |
| „ of body at anus | 85 | „ |
| „ of body at ventrals | 97 | „ |
| „ of body at pectorals | 95 | „ |
| „ of head at isthmus | 79 | „ |
| „ of head just behind eye | 72 | „ |
| Breadth of body at pectorals | 36 | „ |
| Length of head | 104 | „ |
| „ of snout | 25 | „ |
| Snout to foremost nostril | 13.5 | „ |
| Horizontal diam. of eye | 17 | „ |
| Vertical diam. of eye | 14 | „ |
| Interorbital space | 23 | „ |
| Postorbital part of head | 66.5 | „ |
| Snout to ventral | 241 | „ |
| „ to dorsal | 254 | „ |

| | | |
|---|---|---|
| Snout to anal | 292 | mm. |
| First dorsal spine to last dorsal spine | 106 | „ |

Dorsal spines IX + 1 flexible ray.
Anal spines XV and anal soft rays 125—130.
Pectoral rays 17.
Ventral III spines 7 soft rays.

| | |
|---|---|
| Height of body betw. pectoral and ventral in proportion to total length | 1 : 6.18 |
| Height of body betw. pectoral and ventral in proportion to snout to anus | 1 : 2.76 |
| Height of head behind eye in proport. to height of body at anus | 1 : 1.18 |
| Height of body at pectoral in proport. to height of body at ventral | 1 : 1.02 |
| Breadth of body at pectoral in proport. to height of body at pectoral | 1 : 2.64 |
| Length of head in proportion to total length | 1 : 6.18 |
| „ of head in proportion to snout to anus | 1 : 2.76 |
| Height of head at isthmus in prop. to snout to anus | 1 : 3.64 |
| Length of snout in proport. to length of head | 1 : 4.16 |
| Horiz. diam. of eye in proport. to length of head | 1 : 6.12 |
| Horiz. diam. of eye in proport. to length of snout | 1 : 1.47 |
| Interorbital space in proport. to length of head | 1 : 4.53 |
| Horiz. diam. of eye in proport. to interorb. space | 1 : 1.35 |
| Length of snout in prop. to postorb. part of head | 1 : 2.66 |
| Snout to ventral in proport. to total length | 1 : 2.68 |
| Snout to dorsal in proport. to total length | 1 : 2.54 |
| Length of head in proport. to snout to dorsal | 1 : 2.44 |

### *Macdonaldia sp.*

Pl. IV, fig. 2.

1 specimen, 32 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

This fish agrees largely with GILL and TOWNSEND's *Macdonaldia longa* (No. 33, pag. 232), but the latter has a double row of teeth on the palatines, and 10 rays in the pectoral fin, whereas the fish from the "M. S." has a single series of palatine teeth, and 14 pectoral rays. In addition, there is some difference between the two in the proportions of head to body, eye to head, and length of eye to length of snout.

They cannot, therefore, be regarded as identical, but it will nevertheless be most correct not to decide whether the present specimen is a new species or not until it has been directly compared with *Macdonaldia longa*. Otherwise this specimen approaches very near to *Notacanthus challengeri*, VAILLANT (No. 86, pag. 388).

The assistant curator of the division of fishes at the U. S. National Museum, Mr. B. A. BEAN, has very kindly taken measurements of GILL and TOWNSEND's type specimen, and given a description of the same, which is inserted here.

*Macdonaldia longa*, Gill & Townsend.

(Notes and measurements taken from type specimen, No. 48775 U. S. National Museum, by B. A. Bean).

Body comparatively slender with the greatest height about one-fifth of the distance between vent and tip of snout. Pectoral fin with its root three times as far from upper cleft of branchial aperture as from lateral line, and very much nearer lateral line than end of operculum.

Dorsal 33. Anal (26 to opposite end of dorsal) 55 spines 111 rays.

Teeth in the jaws closely set, sharp, curved inwards and backwards. Palatine teeth similar to those of the jaws, but in a double series. Lingual teeth small, similar in structure to those of the jaws.

The long diameter of the eye is contained two times in length of snout, depth of head to eye, equals length of snout to pupil. Depth of body at anal equals length of head from posterior edge of pupil to end of operculum.

Pectoral fins with ten rays, the length of which cannot be measured on account of their broken condition.

First spine of dorsal slightly in advance of root of pectoral. The first anal spine opposite the 18th dorsal spine.

Colour in spirits, reddish brown shading to gray. Opercles darkish gray with black margin.

Measurements.

| | | |
|---|---|---|
| Total length | 532 | mm. |
| Snout to anus | 211 | „ |
| Height of body at anus | 44 | „ |
| „ „ ventrals | 44 | „ |
| „ „ pectorals | 33 | „ |
| Length of head | 64 | „ |
| „ of snout | 20 | „ |
| Preoral part of snout | 18 | „ |
| Horizontal diam. of eye | 10 | „ |
| Postorbital part of head | 40 | „ |
| Eye to upper angle of gill-opening | 27 | „ |
| Height of head at eye | 23 | „ |
| Greatest breadth of head at operculum | 20 | „ |
| From snout to pectoral | 85 | „ |
| „ „ ventral | 180 | „ |
| Length of pectoral (imperfect) | 23 | „ |
| „ of ventral | 24 | „ |
| Snout to first dorsal spine | 80 | „ |
| Last dorsal spine to tip of caudal | 180 | „ |
| Anus to tip of caudal | 325 | „ |

| | *Macdonaldia longa*, Gill and Townsend. | *Macdonaldia challengeri*, Vaillant. | *Macdonaldia africana*, Gilchrist and von Bonde. | *Macdonaldia sp.* |
|---|---|---|---|---|
| D..... | XXXIII, first spine slightly in advance of root of pectoral. | XXXIV—XXXV, the first above the root of the pectoral. | XXXVI, first over middle of pectoral. | XXXVI, the first over origin of pectoral. |
| A..... | LV, 111 = 166. | LIV, x (79) = 133 Günther; about XL, 140 = 180 Jordan & Evermann. The foremost 26 spines without membrane between them. The membrane gradually imbed the following. To judge from the figure there are abt 30 inarticulate spines. Günther: "Anal spines very gradually and but slightly increasing in length behind, passing finally into flexible rays of varying and indefinite number." Jordan and Evermann: "The anal spines pass so gradually into the rays that they are distinguishable with difficulty. Definite articulations appear before the rays have lost their spinous character, while still stiff and pungent. Dividing them on the basis of these articulations, the anal fin contains 40 spines and about 140 soft rays." | XLVII. The spines increasing to the 4th, after which they are all same size and at the 47th they pass into flexible rays. | XLIV, 121 *viz.* 28 inarticulate, 16 articulate spines and abt. 121 soft rays = 165. The spines increasing in length behind and are gradually imbedded in the membrane. |
| P..... | 10. Root three times as far from upper cleft of branchial aperture as from lateral line. Very much nearer lateral line than end of operculum. | 11. Root 4¾ times as far from upper cleft of branchial aperture as from lateral line. Very much nearer lateral line than end of operculum. Its length more than its distance from operculum. | 12. Root four times as far from upper cleft of branchial aperture as from lateral line. Very much nearer lateral line than end of operculum. Its length equal to its distance from operculum. | 14. Root three times as far from upper cleft of branchial aperture as from lateral line. Very much nearer lateral line than end of operculum. Its length more than its distance from operculum. |
| V..... | | I, 9. Ventral close to, but not extending to the vent. | I, 9. Ventrals do not reach to the vent. | II, 8. Thev entrais reach to the vent. |
| Depth in distance from vent to tip of snout..... | 5 | 5 | 4 | 4.6 |
| Depth in length of head ..... | 1.45 | 1.6 | 1.6 | 1.7 |
| Head in total length | 8.3 | 7.6 | 7 | 6.7 |
| Head in distance from vent to tip of snout..... | 3.3 | 3.1 | 2.7 | 2.7 |
| Snout in head..... | 3.2 | 3.3 | 3 | 3 |
| Eye in snout..... | 2 | 2 | 2.5 | 2.5 |
| Eye in postorbital part of head ..... | 4 | 4 | 4 | 4.3 |
| | | Cleft of mouth to posterior nostril. | Cleft of mouth to posterior nostril. | Cleft of mouth to the foremargin of eye. |
| | No maxillarly spine mentioned. | No maxillary spine mentioned nor figured by Günther. Maxillary spine very evident in Jordan & Evermann's specimen. | No maxillary spine mentioned nor figured. | Maxillary spine evident. |
| | Teeth in the jaws closely set, palatine teeth similar but in a double series. Lingual teeth small. | 31 teeth on each side of the upper and 23 teeth on each side of the lower jaw 21 teeth in each half of the palatine series. The diameter of the eye greater than interorbital width. | Each jaw with series of minute teeth and similar series on vomer and palatines. | In the præmaxilla 25 teeth. In the mandible 25 „ In the palatines a single series. The interorbital space is greater than the eye. |

*Macdonaldia sp.* from the cruise of "Michael Sars".

The height of the body at anus goes 11 1/2 times into the total length, 4 6/10 times into the length of body to anus, the breadth of the body at the anus goes 2 1/3 times into the height. Length of body to anus 2 1/2 times in total length, and the tail from the anus to point of the caudal fin goes 1 2/3 times into the total length, as in *M. challengeri* (No. 43, pl. LXI, fig. B). The head goes barely 6 2/3 times into the total length, and barely 2 2/3 times into the body in front of anus; *i. e.* the head is slightly larger than stated by GÜNTHER for the one specimen of *challengeri* (No. 43, pag. 250). The snout is 1/3 the length of head and its præoral part half the whole snout. The eye is abt. 1 1/4 times as long as it is high. Its horizontal diameter is to the length of head as 1 : 7 1/3, and to the snout as 1 : 2 1/2; it goes 4 1/3 times into the postorbital part of head. The interorbital space is greater than the eye, and equal to the præoral part of the snout. The eye is thus smaller than stated for *challengeri*, for which GÜNTHER states: "The eye is . . . distant two diameters from the end of the snout; . . . its diameter exceeds the width of the interorbital space". In the great distance between the eyes there is also a marked difference from *M. rostrata*, where the interorbital space was smaller than either the horizontal or the vertical diameter of the eye. The mouth reaches to the foremargin of the eye. The upper jaw has a rearward pointing spine. In the præmaxilla, abt. 25 teeth were counted, as against 31 in *challengeri*, and in the mandible abt. 25. On the palatines is a single series of teeth.

The dorsal spines are 36 in number. The first is situate over the origin of the pectoral fin, the last, as in *challengeri*, behind the middle of the tail (No. 43, pag. 251) at a distance from the point of the caudal fin equal to 1/3 of the total length. There is no spine in the membrane behind the last dorsal spine. There are 28 inarticulate anal spines, 16 articulate, and abt. 121 soft rays. The anal fin has thus in all abt. 165 rays. The membrane between the inarticulate spines extends for only about the inner two-thirds of these, save in the case of the last two, and does not extend in a flap beyond their point. The basal portion of the membrane between the articulate and inarticulate spines is scale-covered. The length of the last articulate spine lies midway between the length of the penultimate articulate one and that of the first soft ray. The soft-rayed part is the highest part of the fin.

According to GÜNTHER, *M. challengeri* has abt. 133 anal fin rays in all, but he himself states, "flexible rays of varying and indefinite number." From his drawing, the number of inarticulate spines answers to that in the present specimen of *Macdonaldia;* possibly *challengeri* may have more articulate spines; in our specimen, the articulate and inarticulate together number 44, whereas *challengeri* has 54 spines; as in GÜNTHER's figure, where the last ones are connected by high membrane, so also here the two last inarticulate spines, and all the articulate ones are connected by membrane for nearly their whole length. JORDAN and EVERMANN (No. 56, pt. I, pag. 617) give, for the anal, abt. 40 spines and 140 soft rays. The pectoral fin has 14 rays; *challengeri* is stated as having 11; its distance from the uppermost point of the branchial aperture is 3 times as great as its distance from the lateral line, and this distance is equal to half its distance from the head.

In *M. challengeri,* to judge from the figure, the distance between head and pectoral fin should be 2 3/4 times, and between uppermost point of branchial aperture and pectoral fin 4 3/4 times the distance from pectoral fin to lateral line. The ventral fin is situate below the 14th dorsal spine, and reaches to the anus; it has 2 spines, and 8 soft rays, but of the two spines, the first is insignificant, being quite embedded in the skin. The ventral fins are separate.

The lateral line is almost straight; from this originate one row of pores down over the præoperculum to the mandible, one with a distinct canal behind and below the eye to the upper jaw, and one over the eye and nostrils out to the upper side of the snout.

The fish is covered with small scales, only the posterior margin of the gill-cover, the branchiostegal membrane, and the lips being free from scales. These nude parts are black; otherwise, the colour is light, save that the black skin of the gill-cover shines through the scale covering and gives a bluish tinge.

GILCHRIST and von BONDE have in 1924 given a description of a Notacanthid named *Macdonaldia africana* (No. 31 b, pag. 11, pl. III, fig. 1). Comparing their figure with the drawing of *Macdonaldia sp.* from St. 53, it is evident that there are some differences.

The cleft of the mouth goes longer behind, the pectorals and especially the ventrals are a little shorter than on *Macdonaldia sp.*; the dorsal spines begin more backwards and the spines of the anal are completely embedded in the membrane.

If one, however, compare the descriptions and the measurements, one will find accordance in many points between *Macdonaldia longa,* GILL & TOWNSEND (No. 33, pag. 232 and this paper pag. 71), *M. challengeri,* VAILLANT (No. 43, pag. 250, pl. LXI, fig. B and No. 56, pt. I, pag. 617), *M. africana,* GILCHRIST & von BONDE (No. 31 b, pag. 11, pl. III, fig. 1) and *Macdonaldia sp.* from "Michael Sars", St. 53. It is therefore a question, if a direct comparison of these fishes will maintain the species.

A juxtaposition of the characters will show the accordances and the differences between them. *(Vide* pag. 72).

As to *Macdonaldia challengeri* and *M. africana* the measurements are taken on the figures, when they are not found in the text.

| | | |
|---|---|---|
| Total length | 321 | mm. |
| Snout of anus | 129 | „ |
| Height of body at anus | 28 | „ |
| „ „ ventrals | 27 | „ |
| „ „ pectorals | 22 | „ |
| Breadth of body at anus | 12 | „ |
| Length of head | 48 | „ |
| „ of snout | 16 | „ |
| Preoral part of snout | 8 | „ |
| Horizontal diam. of eye | 6.5 | „ |
| Vertical „ „ | 5 | „ |
| Interorbital space | 8 | „ |
| Postorbital part of head | 28 | „ |
| Eye to foremost point of gill-opening | 17.5 | „ |
| Height of head at eye | 13 | „ |
| Breadth of head at foremost point of gill-open. | 13 | „ |
| From head to pectoral | 14 | „ |
| „ foremost point of gill-open. to pectoral | 21 | „ |
| „ pectoral to lateral line | 7 | „ |
| „ snout to pectoral | 61 | „ |
| Length of pectoral | 18 | „ |
| Snout to ventral | 112.5 | „ |
| Length of ventral | 17 | „ |
| Snout to first dorsal spine | 59 | „ |
| Last dorsal spine to tip of caudal | 105.5 | „ |
| Anus to tip of caudal | 192 | „ |

D. 36 spines
A. 28 inarticulated spines
16 articulated spines
abt. 121 soft rays

abt. 165 in all
P. 14
V. II 8

| | |
|---|---|
| Snout to anus in proportion to total length | 1 : 2.49 |
| Height at anus in proportion to total length | 1 : 11.5 |
| „ at anus in proportion to snout to anus | 1 : 4.61 |
| „ at ventrals in proportion to total length | 1 : 11.9 |
| „ at ventrals in proport. to snout to anus | 1 : 4.78 |
| „ at pectorals in proport. to total length | 1 : 14.6 |
| „ at pectorals in proport. to snout to anus | 1 : 5.86 |
| Length of head in proportion to total length | 1 : 6.69 |
| „ of head in proportion to snout to anus | 1 : 2.69 |
| „ of snout in proport. to length of head. | 1 : 3.00 |
| „ of snout in proport. to postorb. part of head | 1 : 1.75 |
| Preoral part of snout in proportion to snout | 1 : 2.00 |
| Horizontal diam. of eye in proportion to head. | 1 : 7.39 |
| „ diam. of eye in „ to snout | 1 : 2.46 |
| Horizontal diam. of eye in proportion to post-orbital part of head | 1 : 4.31 |
| Vertical diam. of eye in proportion to horiz. diam. of eye | 1 : 1.23 |
| Length of postorb. part of head in proportion to head | 1 : 1.72 |
| Height of head at eye in proportion to head | 1 : 3.69 |
| Breadth of head at foremost point of gill-open. in proportion to head | 1 : 3.69 |
| From head to pectoral in proportion to head | 1 : 3.43 |
| Snout to pectoral in proportion to total length | 1 : 5.26 |
| „ to ventral in proportion to total length | 1 : 2.85 |
| „ to dorsal in proport. to snout to pectoral | 1 : 1.03 |
| Anus to tip of caudal in proport. to total length | 1 : 1.67 |

### ***Macdonaldia rostrata,*** Collett.

Pl. IV, fig. 3.

1889. *Notacanthus rostratus,* Collett (No. 13 a, pag. 307).
1895. *Macdonaldia rostrata,* (Collett), Goode & Bean (No. 37, pag. 171, figs. 189, 195 A, B).
1896. *Notacanthus rostratus,* Collett (No. 13, pag. 48, pl. V. fig. 21).
1898. *Polyacanthonotus (Macdonaldia) rostratus,* (Collett), Lütken (No. 66, pag. 12).

1 specimen, 18 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

1 specimen, 29 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

The two specimens are smaller than the one described by Collett, or the three by Goode and Bean, or that by Lütken; the height of body therefore, is less in proportion, the head larger; this being most markedly noticeable in the smaller of our two individuals. Goode and Bean give the distance from the pectoral to the head as twice the length of the former (No. 37, pag. 172); in both the specimens from the "Michael Sars" it is situate considerably nearer the head, but in the larger of the two approximately as stated by Collett (No. 13, pag. 51), to wit, at a distance from the head answering to the total length of the snout and one-half the diameter of the eye. Otherwise, the measurements and proportions between the various parts answer very well to those found by Collett.

With regard to the fins there is a good deal to note. Collett counts 27 spines along the back; Goode and Bean in one specimen 28, in another 30, and a small spine connected with the 30th. Lütken gives 33; the larger of our two individuals has 35 dorsal spines, the smaller 29, and both have, like the one taken by the "Albatross", a small spine behind the last. The third spine is situate above the pectoral fin.

The anal fin in the larger specimen has abt. 235 rays, in the smaller abt. 237; of these, however, 36 and 32 respectively are inarticulate spines; COLLETT counts 245 rays, of which 53 inarticulated spines, whereas GOODE and BEAN note a variation in the number of spines from 42 to 53, and LÜTKEN states 45. In the *Notacanthus* taken at St. 95, the posterior spines, which are all inarticulate, bear traces of former articulation, whence it is evident that articulate spines are transformed into inarticulate.

The pectoral fin has 15 and 14 rays; the ventral has 10 soft rays, but in the smaller specimen it has also, embedded in the skin, one small spine; it is situate beneath the space between the 12th and 13th dorsal spines. In the larger specimen, it does not reach to the anus, but in the smaller extends past the anus and the first anal spine. Finally, the following should be observed.

In addition to the row of pores to the mandible mentioned by COLLETT (No. 13, pp. 51, 52) and that observed by GOODE & BEAN, behind and below the eye, — here in a distinct channel — out beyond the upper jaw, there is also a further row of pores above the eye and nostrils out on to the upper side of the snout.

| | mm. | mm. |
|---|---|---|
| Total length | 180 | 288 |
| Snout to anus | 58 | 104 |
| Height of body at anus | 11 | 21.5 |
| „ of body at ventrals | 11 | 20.5 |
| „ of body at pectorals | 9.3 | 16.8 |
| Length of head | 23 | 34 |
| „ of snout | 8.7 | 11.5 |
| Preoral part of snout | 3 | 3.8 |
| Horizontal diam. of eye | 3.5 | 5.2 |
| Vertical diam. of eye | 2.8 | 4.3 |
| Interorbital space | 2.3 | 3.5 |
| Postorbital part of head | 12.2 | 18 |
| Eye to foremost point of gill-opening | 8 | 12 |
| Height of head at eye | 7 | 12 |
| Breadth of head at foremost point of gill-opening | 6 | 9.5 |
| The mouth reaches the hindborder of foremost nostril | | |
| The upper jaw with a curved spine directed backward | | |
| From head to pectoral | 7 | 13.5 |
| „ foremost point of gill-opening to pectoral | 12 | 18 |
| „ pectoral to lateral line | 2.5 | 4 |
| Snout to pectoral | 29 | 47 |
| „ to ventral | 52 | 90 |

| | mm. | mm. |
|---|---|---|
| Snout to 1st dorsal spine | 27 | 38 |
| Last dorsal spine to tip of caudal | 68 | 99 |
| Anus to tip of caudal | 120 | 181.5 |
| Teeth in the præmaxilla | | abt. 22 |
| „ in the mandible | abt. 19 | |
| Dorsal spines | 29 | 35 |
| The third dorsal spine over pectoral. A little inarticulated spine joined with membrane to last spine. | | |
| Anal inarticulated spines | 32 | 36 |
| „ articulated spines | 50 | 59 |
| „ soft rays | abt. 150 | abt. 140 |

On the specimen 180 mm. the membrane connecting the spines is lowest between the foremost spines and as far as can be seen, the membrane here is higher on the back of the spines than on their front and has here been prolonged by a free flap behind the point of the spine.

Ventrals 10 soft rays, on the specimen 180 mm besides these a little spine imbedded in the skin. Situate below the interval between 12th and 13th dorsal spine. The length on specimen 180 mm. 8.8 mm., on specimen 288 mm. 13 mm. On specimen 180 mm. the ventrals pass 1st anal spine, on specimen 288 mm. they do not reach anus.

Pectoral on specimen 180 mm. 14 soft rays, on specimen 288 mm. 15. Length on specimen 180 mm.: 12 mm., on specimen 288 mm.: 15 mm.

| | 180 mm. | 288 mm. |
|---|---|---|
| Total length | | |
| Snout to anus in proport. to total length | 1 : 3.10 | 2.77 |
| Height at anus do. to total length | 1 : 16.35 | 13.4 |
| „ at anus do. to snout to anus | 1 : 5.27 | 4.84 |
| „ at ventrals do. to total length | 1 : 16.35 | 14.1 |
| „ at ventrals do. to snout to anus | 1 : 5.27 | 5.07 |
| „ at pectorals do. to total length | 1 : 19.35 | 17.2 |
| „ at pectorals do. to snout to anus | 1 : 6.24 | 6.20 |
| Length of head do. to total length | 1 : 7.83 | 8.48 |
| „ of head do. to snout to anus | 1 : 2.52 | 3.06 |
| „ of snout do. to head | 1 : 2.64 | 2.96 |
| Preoral part of snout do. to snout | 1 : 2.90 | 3.03 |
| Horizontal diam. of eye do. to head | 1 : 6.58 | 6.54 |
| „ diam. of eye do. to snout | 1 : 2.48 | 2.21 |
| Vertical diam. of eye do. to hor. diam. of eye | 1 : 1.25 | 1.21 |
| Length of snout do. to postorbital part of head | 1 : 1.40 | 1.57 |
| Horizontal diam. of eye do. to postorbital part of head | 1 : 3.48 | 3.46 |
| Postorbital part of head do. to head | 1 : 1.88 | 1.89 |

| | | |
|---|---|---|
| Eye to foremost point of gill-open. do. to head | 1 : 2.88 | 2.84 |
| Height of head do. to length of head | 1 : 3.28 | 2.84 |
| Breadth of head do. to length of head | 1 : 3.84 | 3.58 |
| From head to pectoral do. to head | 1 : 3.28 | 2.52 |
| Snout to pectoral do. to total length | 1 : 6.21 | 6.13 |
| „ to ventral do. to total length | 1 : 3.46 | 3.20 |
| „ to first dorsal spine do. to snout to pectoral | 1 : 1.07 | 1.24 |
| „ to first dorsal spine do. to last spine to tip of caudal | 1 : 2.52 | 2.60 |
| Anus to tip of caudal do. to total length | 1 : 1.50 | 1.53 |
| Length of pectoral do. to head | 1 : 1.92 | 2.26 |
| „ of ventral do to head | 1 : 2.62 | 2.62 |

## SUBORDER CATOSTEOMI.

### *Centriscidæ.*

***Centriscus scolopax,*** Lin.

1861. *Centriscus scolopax,* (Linné), Günther (No. 41, III, pag. 518).

Many specimens, St. 39, 21/5, N. 26° 3′, W. 15′ 0°, 267—280 m., fine grey sand.

## SUBORDER PERCESOCES.

### *Atherinidæ.*

***Atherina presbyter,*** Cuv. & Val.

1835. *Atherina presbyter,* Cuvier & Valenciennes (No. 18, vol. X, pag. 439, pl. 304—05, fig. 2).
1861. „ „ (Cuvier), Günther (No. 41, III, pag. 392).
1868. „ „ (Cuv. & Val.), Steindachner (No. 83, pag. 677).
1881. „ „ (Cuv. & Val.), Moreau (No. 67, III, pag. 207).
1880—84. „ „ (Cuv. & Val.), Day (No. 19, I, pag. 225, pl. LXV, fig. 1).
1891. „ „ (Cuv. & Val.), Moreau (No. 67, Suppl., pag. 57).
1904. „ „ (Cuv. & Val.), Borsieri (No. 6, pag. 146, pl. VI).

32 specimens, 9—14 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

32 were preserved, but the Spanish fishermen took surely great numbers of them in the net which they were dragging close in to shore to catch bait for their lines when fishing for breams far out in deeper water.

D. 8, A. I, 14—15, lat. line 55—60, transv. $^4/_5$.

Eye $2^1/_2$—3 in head. Ovaries with eggs not yet ripe about 1 mm. diam.

## SUBORDER ANACANTHINI.

### *Macruridæ.*

***Trachyrhynchus trachyrhynchus,*** Risso.

1887. *Trachyrhynchus trachyrhynchus,* (Risso), Günther (No. 43, pag. 152, pl. XLI, fig. C).
1888. *Macrurus trachyrhynchus,* (Risso), Vaillant (No. 86, pag. 250, pl. XXI, fig. 2).

16 specimens, 7 of them measured abt. 29—38 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

19 specimens, abt. 17—55 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

We have taken the opportunity of comparing *T. trachyrhynchus* with the *T. murrayi* from the "Michael Sars" 1902 (No. 14 b, pag. 62). As will be seen from the following tables, the principal difference lies in the extent of the series of enlarged scales on each side of the dorsal and anal fins. In *T. murrayi,* the enlarged scales along the dorsal fins behind a line drawn vertically through the anus number only 8—10, possibly some few of the hindmost may be missing, but GÜNTHER's figure does not show more than 12 behind the anus. In *T. trachyrhynchus* there are 23—42 of these behind a vertical through the anus. In the ventral rows, *T. murrayi* has 5—11 enlarged scales in front of the anus, whereas in *T. trachyrhynchus,* they first begin at the anus. In addition, the enlarged scales along the anal fin are broader in *murrayi* than in *trachyrhynchus;* the spines also, are set horizontally in *murrayi,* whereas in *trachyrhynchus,* they point obliquely downward, forming an angle with the basal part of the scale, so that the anal fin appears lying in a furrow. Whether the spines are serrate or no, however, is of minor importance; thus in a *T. murrayi* for instance, of 35.5 cm., several of the spines in the dorsal series are bifurcate, while in the ventral, some of the foremost are seen to have two points, one of them even three, whereas a *T. trachyrhynchus* of 25 cm. has all the dorsal spines smooth and single, and of the ventral, only a few have two points. In a *T. trachyrhynchus* of 35.5 cm. the spines are for a great part still smooth and single; of the dorsal, only a few have two points, or a slight indication of dentition; of the ventral, several among the foremost enlarged scales have two or three spines. *T. trachyrhynchus* 55 cm. on the other hand, has all the dorsal spines serrated, but the rearmost of the ventral ones are still smooth.

In a *T. trachyrhynchus* of 25 cm. the body scales between the first dorsal fin and the lateral line have 1 or 2 spines, those under the lateral line 1 spine. In the specimen of 55 cm. the scales at the first dorsal fin in

*Trachyrhynchus trachyrhynchus.*

(Total length in cm., other measurements in mm.).

| Total length | Height of body | Length of head | Length of snout | Horiz. diam. of eye | Vert. diam. of eye | Interorbital space | Snout to hind-margin of eye | Isthmus to anus | Snout to ventral | Snout to pectoral | Snout to anus | $D_1$ rays | P rays | V rays | Series of scales between $D_1$ and lat. line | Number of spines on scales between $D_1$ and lat. line | Number of spines on scales below lat. line | Number of enlarged dorsal scales behind anus | Number of enlarged ventral scales before anus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 29 | 74 | 31.5 | 21 | 13 | 19 | 52 | 42 | 70 | 75 | 98 | 11 | 21 | 7 | 3 | 1—2 | 1 | 23-26 | 0 |
| 29 | 38.5 | 85 | 36 | 24 | 15 | 21 | 59 | 53 | 82 | 85 | 114 | 11 | 20 | 7 | 3 | — | 1—3 | 33 | 0 |
| 35.5 | 45 | 106 | 45.5 | 27.5 | 17 | 25.5 | 74 | 69 | 104 | 109 | 145 | 12 | 21 | 7 | 3 | 3 | 3 | 42 | 0 |
| 46 | — | 132 | 55 | 34 | 21 | 38 | 91 | 99 | 120 | 136 | 188 | 12 | 20 | 7 | 3 | 4—5 | 3—4 | 27 | 0 |
| 55 | 95 | 173 | 70 | 42 | 26 | 46 | 113 | 133 | 159 | 175 | 250 | 11 | 18 | 7 | 3 | 3—6 | 3 | 23 | 0 |
| *Trachyrhynchus murrayi.* | | | | | | | | | | | | | | | | | | | |
| 26 | — | 73.5 | 31 | 21.7 | 12.5 | 17 | 52 | 43 | 68 | 73 | 98.5 | 11 | 21 | 7 | — | — | — | 8 | 5 |
| 29 | 34.5 | 84 | 34 | 25 | 14 | 22 | 58.5 | 51.5 | 77.5 | 84 | 112.5 | 11 | 21 | 7 | — | — | — | 8 | 8 |
| 30 | 37 | 82.5 | 34 | 23 | 14.5 | 21 | 57 | 54.5 | 80 | 85 | 113.5 | 11 | 21 | 7 | — | — | — | 10 | 8 |
| 35.5 | 46 | 97 | 38 | 28.7 | 16 | 26 | 66 | 71 | 92 | 98 | 137 | 10 | 21 | 7 | — | — | — | 8 or 10 | 11 |

the uppermost row below the enlarged scales have 6 spines, in the second row 3; then comes the lateral line, and on the side of the body beneath it, the scales have 3 spines.

Fig. 16. *Trachyrhynchus trachyrhynchus,* Risso. 25 cm. Scale above the lateral line (× 23).

The scales of the 25 cm. specimen (fig. 16) show 3 zones formed by the concentric bands lying closer to one another between the zones than in them; in the specimen of 55 cm. the concentric stripes are very indistinct. This fish has on its back the mark of a bite; there is a break in the second dorsal fin; the row of spines on the left side here makes a slight incurvation, while on the right side it is interrupted and replaced by scales with small spines.

*Trachyrhynchus trachyrhynchus.*

| Total length | Total length: Length of head | Length of head: Length of snout | Length of head: Horizontal diam. of eye | Length of snout: Horizontal diam. of eye | Horizontal diam. of eye: Vert. diam. of eye | Total length: Snout to anus | 1910 Station |
|---|---|---|---|---|---|---|---|
| abt. 25 cm. | 3.38 | 2.34 | 3.52 | 1.50 | 1.62 | 2.55 | 23 |
| „ 29 „ | 3.41 | 2.36 | 3.54 | 1.50 | 1.60 | 2.54 | 4 |
| „ 35.5 „ | 3,35 | 2.33 | 3.86 | 1.65 | 1.62 | 2.45 | 4 |
| „ 46 „ | 3.48 | 2.40 | 3.88 | 1.62 | 1.62 | 2.45 | 23 |
| „ 55 „ | 3.18 | 2.47 | 4.12 | 1.67 | 1.62 | 2.20 | 23 |
| *Trachyrhynchus murrayi.* | | | | | | | 1902 Station |
| abt. 26 cm. | 3.54 | 2.37 | 3.38 | 1.43 | 1.74 | 2.64 | 76 |
| „ 29 „ | 3.46 | 2.47 | 3.36 | 1.36 | 1.79 | 2.58 | „ |
| „ 30 „ | 3.64 | 2.42 | 3.59 | 1.48 | 1.59 | 2.64 | „ |
| „ 35.5 „ | 3.66 | 2.55 | 3.38 | 1.32 | 1.79 | 2.59 | „ |

***Macrurus (Coelorhynchus) talismani,*** Collett.

1888. *Macrurus japonicus*, Vaillant, (non Temm. Schleg.) (No. 86, pag. 254, pl. XXI, fig. 1).
1905 (09). *Coryphænoides (Coelorhynchus) talismani*, Collett (No. 14 b, pag. 58).
1916. *Coelorhynchus vaillanti*, Roule (No. 79 b, pag. 20).
1919. „ „ „ (No. 79 c, pag. 81, pl. III, figs. 3, 3 a, 3 b, 3 c).

7 specimens, 10—15 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

1 specimen, 41 cm., St. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

7 specimens, 19—33 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

The *Coelorhynchus* brought home by the "Michael Sars" from the WYVILLE THOMSON Ridge in 1902 were shown by COLLETT (No. 14 b, pag. 59) to be identical with those taken by the "Talisman" and "Travailleur" expedition between the Azores and Cape Verde Islands. He pointed out also, however, that they did not as VAILLANT believed, belong to the species *Macrurus japonicus*, SCHLEGEL, and he therefore gave them the new name *talismani*.

Those caught in 1910 are evidently of the same species as described by COLLETT in 1902, as will be seen from the following description. A comparison has here been made with the species *parallelus* GÜNTHER, *occa* GOODE & BEAN, *aratrum* GILBERT and *doryssus* GILBERT, as these are closely related to *talismani*; so closely indeed, that VAILLANT in 1888 was of opinion that *parallelus*, *occa* and *talismani*, which he of course, called *japonicus*, should be taken as one (No 86, pag. 257). There are, however, differences between them which justify their being kept apart as separate species. On the other hand, there is so great a resemblance between *labiatus*, described by KOEHLER in 1896 (No. 57, pag. 497) and *talismani*, that they are probably one and the same species; we have not, however, been able to examine KOEHLER'S *labiatus*.

*Coelorhynchus talismani* is a *Macrurus* with head extending out into a flattened and pointed snout. A ridge on either side divides the head into a convex upper side and a flat underside. On the lower side is the mouth, with teeth in villiform bands in both upper and lower jaw. The body and the compressed long and pointed tail are covered with spiny imbricate scales.

The greatest height of the body lies about the commencement of the foremost dorsal fin. The height of the body is from $^1/_7$ to $^1/_{10}$ of the total length, and somewhat less than half the length of the head. The tail makes up about $^2/_3$ of the total length of the fish, and as the head again amounts to about $^1/_3$ of the foremost third of the fish, there remains but little for the body itself. The length of the head is contained about $3^1/_3$ to $4^1/_3$ times in the total length.

The most remarkable feature of the head is, as already mentioned, the flat underside and the pointed snout. The lower side of the head is bounded on either hand by a ridge running the whole length of the head, the two meeting at the point of the snout in an angle of 55°. A little behind the point of the snout they turn off, so that they would form an angle of 24°. In other words, they form, close to the point of the snout, a concave line, but in their greatest length a convex, the breadth of the head decreasing slightly again behind the mouth. The præorbital portion of the ridges is composed of a single row of indented osseous plates, the postorbital part of a double row of the same. In addition to these two infraorbital ridges, there is also a supra-orbital and an occipital ridge on either side. There is also a rudimentary median ridge. The snout is curved slightly upwards; it amounts in some specimens to nearly half the length of the head. The next feature producing a characteristic effect is that of the large oval eyes.

The eyes are almost as large as the postorbital portion of the head, and may amount to half the length of the snout, the proportion between the longitudinal diameter of the eye and the length of the snout varying from 1 : 1.43 to 2.00. The upper contour of the eye is straight. The proportion between vertical and longitudinal diameters is from 1.24 to 1.45. The mouth is situate at about the same distance from the point of the snout as the eyes. It is shaped like a horseshoe, and the distance from one corner of the mouth to the other is slightly less than half the width of the head there. The upper lip is thickest in the middle of its right and left side. The barbel is small, about half as long as the pupil of the eye. The nostrils are situate immediately in front of the eye, and separated one from another by a black flap which gives to each the appearance of a crescent, the foremost with its concave side turned rearwards, and the hinder one with its concave side pointing forward. The vertical diameter of the hinder one is $2^1/_4$—$3^1/_2$ times as long as that of the foremost. Behind the eye is the præoperculum, the lower posterior portion of which extends in a flap out round the posterior plate of the infraorbital ridge, so that the lower posterior corner of the head is formed by the præoperculum. In the triangular field above and behind the præoperculum lie the operculum and suboperculum. There is no interoperculum.

The 1st dorsal fin has 8—11 rays, of which the foremost is very short. The second ray is the longest. It may be of about the same length as the snout, or as the

height of the body, which comes to the same thing. It is smooth, unarmed. Just above the anus, the second dorsal fin begins. This is low, the anal fin being conderably higher. The ventral fins have 7 rays, and are situate almost immediately under the commencement of the first dorsal fin. The 1st ray is prolonged, and extends out to the second anal ray. The pectoral fins are situate farther forward; they have from 15 to 18 rays, of which the longest extend out over the front edge of the anus.

The upper side of the head is covered with spinous bone plates, only the parts about the nostrils being left bare. The lower side is bare, save for the extreme point of the snout. Osseous processes are, however, found close inside the lateral edge in young specimens under 30 cm.

Along the lateral line there are about 120 scales. An oblique line from the first dorsal fin to the lateral line includes 4—5 scales; from the anus forward to the lateral line 15—17, and backward 11—12. Over the back between the two dorsal fins there are 5—7 rows of scales.

The scales are, as in the case of most *Macruridæ*, almost hexagonal in shape, the posterior, free portion furnished with rows of spines. VAILLANT has given two good drawings of this (No. 86, pl. XXI, figs. 1 e, f). The scales of the lateral line have two rows of strong spines, one on either side of a median furrow. Otherwise, there will be as a rule one median row of strong spines and series of slighter ones on either side; both this, however, and the form of the scales, as well as the number of rows of spines and their parallel or radial arrangement, will depend upon the part of the body from which the scales are taken. Thus we find a median row, and parallel arrangement of the lateral rows on the scales close above and below the lateral line level with D.1 and the beginning of D.2, whereas the median series is less distinctly marked, and the lateral ones are slightly radial on the scales between the ventral fins. On the forepart of the body there are 3—4 rows of spines on either side of the median; on the tail up to 6 rows on either side. In normal scales, the free field is nearly rhombic, and the innermost spines in the series are small. On what are probably regenerated scales, where the concentric lines are lacking in the middle, the open field is often a quite narrow belt with only a couple of spines in each row; these are then, however, large.

In the stomach of the 330 mm. long specimen was found the mantel of an *Ascidiella* or *Ascidia*, limbs of a *Sergestes*, an ostracod, and remains of copepods.

Following upon this description, we may now make comparison with COLLETT's and VAILLANT's description of the species, and with the species *labiatus*, *parallelus*, *occa*, *aratrum* and *doryssus*.

After the augmentation of the material consequent upon the "Michael Sars" expedition in 1910, it was found that the proportion between eye and snout varied to such a degree as to be inadmissible as a specific character, which COLLETT had reason to believe (No. 14 b, pag. 59).

VAILLANT writes that the distance between the two dorsal fins is less than the length of the base of the first dorsal fin (No. 86, pag. 255). On the "Michael Sars" specimens, this distance is greater than the base of the first dorsal fin. Both in VAILLANT's and the "Michael Sars" specimens, however, the number of scale series over the back between the two dorsal fins is 5. (No. 86, pl. XXI, fig. 1).

From KOEHLER's description and illustration (No. 57, pag. 497, pl. XXVII, figs. 7, 8) it will be seen that the upper lip has two characteristic swellings (No. 57, pag. 498). In the "Michael Sars" specimens, the upper lip is thickest in the middle of its right and left side. It is probably the same thing which gives rise to the swellings on the "Caudan" specimens. KOEHLER's *Coelorhynchus* has 8 rays in the 1st dorsal fin, whereas the "Michael Sars" specimen has 10. The greatest difference, however, appears to be in the case of the barbel. KOEHLER writes "le barbillon est très court" (No. 57, pag. 497). In the specimens from the "Michael Sars", it is about 1/3 the longitudinal diameter of the eye. This being 25 mm. (No. 57, pag. 500) in the large "Caudan" specimen, the barbel should measure about 8 mm., if of relatively the same length as in the "Michael Sars" specimen. And if so, it would surely be visible in the figure, but there, however, it is not or hardly to be seen, so that it would appear to be extremely short. As the drawing is of the head only, and the text does not give any information as to the position of the fins, it is impossible to determine with certainity whether KOEHLER's *labiatus* and *Coelorynchus talismani* are the same species.

In GÜNTHER's *Coelorhynchus parallelus* (No. 43, pag. 125), the length of the head is less than the distance between the barbel and the anus, whereas in *talismani* it is greater.

Another point of difference which appears again in the following species is the fact that the horizontal diameter of the eye is equal to the interorbital distance. Furthermore, the lateral edges of the snout are almost straight or form a single convexity (No. 43, pl. XXIX, fig. A) without any incurvation behind the point of the snout, such as is found in *talismani*, and the lower side of the snout is covered with protuberances (No. 43, pag. 126).

An essential difference is the fact that the pectoral fin stands on a vertical with the dorsal and ventral fins, whereas in *talismani*, it is placed in front of these. The

| Remarks | Total length | Height of body | Width of head | Length of head | Tip of snout to eye | Tip of snout to mouth | Horiz. diam. of eye | Vert. diam. of eye | Interorbital space | Vertical diam. of anterior nostril | Vertical diam. of posterior nostril | Barbel | Postorbital part of head | Tip of snout to anus | Barbel to anus | Tip of snout to $D_1$ | Tip of snout to ventral |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm. 370 | 45 | — | 98 | 45 | — | 27 | — | 22 | — | — | abt. 6 | — | — | — | — | — |
| | 110 | — | — | — | 13 | — | 8 | — | — | — | — | — | — | — | — | — | — |
| | 120 | 12 | 12.2 | 28 | 13 | 13 | 8 | 6.2 | abt. 6.2 | — | — | — | — | 40 | — | 31.5 | 32 |
| | 125 | — | — | — | 14 | — | 9 | — | — | — | — | — | — | — | — | — | — |
| The snout curved upward | 130 | 14 | 14 | 30 | 13.5 | 15 | 8.7 | 7 | abt. 7 | — | — | — | — | 42 | — | 34 | 35.5 |
| Tip of tail is lost | 172 | 21 | 20.5 | 47 | 20 | 20.5 | 14 | 10 | „ 10 | — | — | — | — | 68 | — | 51.5 | 51 |
| | 186 | 20 | 23 | 49 | 22 | 23 | 14 | — | — | — | — | — | — | 71 | — | 55 | 55 |
| | 228 | 25 | 26 | 59 | 25 | 25 | 17.5 | — | — | — | — | — | — | 80 | — | 65 | 65 |
| | 100 | — | — | — | 10 | — | 6.2 | — | — | — | — | — | — | — | — | — | — |
| | 110 | — | — | — | 12 | — | 7 | — | — | — | — | — | — | — | — | — | — |
| | 115 | — | — | — | 12 | — | 7 | — | — | — | — | — | — | — | — | — | — |
| | 117 | 13 | 12.5 | 27.2 | 12 | 11.5 | 7.7 | 6 | — | — | — | — | — | 38 | — | 29 | 31 |
| The outermost of the tip of tail is lost | 119 | 13 | 14 | 30 | 13.5 | 13.2 | 8.7 | 7 | — | — | — | — | — | 39.5 | — | 34 | 34 |
| | abt. 150 | 16 | — | 37 | 16.7 | — | 10 | 8 | 6.8 | 0.8 | 2.9 | — | 11 | 49 | 31 | 41 | 41 |
| Tail regenerated | „ 192 | 24 | 26 | 58 | 28 | 29 | 16 | 11 | 13.8 | — | — | — | — | 77 | — | 63 | 65 |
| The outermost of the tip of tail is lost | „ 210 | — | — | — | 30 | — | 16 | — | — | — | — | — | — | — | — | — | — |
| The outermost of the tip of tail is lost | „ 215 | — | — | — | 30 | — | 17 | — | — | — | — | — | — | — | — | — | — |
| Perfect | 231 | 26 | 25 | 62.8 | 31 | 31 | 17.0 | 12 | 14 | 1.7 | 5 | 5 | 16 | 83.5 | 49.9 | 69.7 | 68 |
| Tail regenerated | „ 242 | — | — | — | 35 | — | 20 | — | — | — | — | — | — | — | — | — | — |
| | „ 320 | — | — | — | 42 | — | 24 | — | — | — | — | — | — | — | — | — | — |
| | „ 330 | 46 | — | abt. 93 | abt. 43 | — | abt. 26 | — | 21.3 | — | — | — | 26.8 | — | — | — | — |
| The outermost of the tip of tail is lost | „ 410 | 50 | — | 108 | 52 | 52 | 26 (pupil 17) | 19 | 23 | 4 | 9 | 9 | 30 | 150 | 92 | 120 | 121 |
| | 330 | 43 | — | 92 | 42 | — | 25 | — | 20 | — | — | — | 25 | — | — | — | — |
| | 405 | 70 | — | 121 | 51 | 43 | 29 | 22 | 29 | 2 | 7 | abt. 7 | 42 | 185 | 130 | 131 | 136 |
| | 305 | 44 | — | 88 | abt. 44 | — | 22 | — | 22 | — | — | abt. 11 | — | — | — | — | — |
| | 450 | 65 | — | 129 | „ 64 | — | 32 | — | 32 | — | — | „ 16 | — | — | — | — | — |
| | 313 | 37.3 | — | 68.8 | 28.4 | 29.9 | 17.3 | 10.4 | 17.3 | — | — | — | 23.9 | 95.5 | 62.7 | 79.2 | 74.6 |
| | 345 | 49.5 | — | 109.1 | 45.6 | 19.5 | 25.7 | 14.8 | — | 2.1 | 8.5 | — | 38 | 145 | 89.7 | 116 | 115.1 |

| Occipital ridge to $D_1$ | Base of $D_1$ | Distance between $D_1$ and $D_2$ | The longest ray in $D_1$ | Length of pectoral fin | Rays of $D_1$ | Rays of P. | Rays of V. | Number of scales in lateral line | Scales between $D_1$ and lat. line | Scales between anus and lat. line obliquely foreward | Scales between anus and lat. line obliquely rearward | Series of scales between $D_1$ and $D_2$ | App. pyl. | Species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | abt. 18 | — | abt. 36 | — | 9 (Text) 10 (Drawing) | 17 | 7 | 106? | 5 | 15 | — | — | — | *talismani*, Collett, "Travailleur" and "Talisman". |
| — | — | — | — | — | 10—11 | — | — | — | 4 | — | — | 7 | — | *talismani*, Collett, "M. S." 1902. |
| 7 | — | — | — | — | " | — | — | — | " | — | — | " | — | |
| — | — | — | — | — | " | — | — | — | " | — | — | " | — | |
| 7.2 | — | — | — | — | " | — | — | — | " | — | — | " | — | |
| 10 | — | — | — | — | " | — | — | — | " | — | — | " | — | |
| — | — | — | — | — | " | — | — | — | " | — | — | " | — | |
| — | — | — | — | — | " | — | — | — | " | — | — | " | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | *talismani*, Collett, "M. S." 1910. |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| 6 | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| 7 | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| 10 | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| 12 | 9 | 11 | 24 | 21.7 | 10 | 17 | 7 | abt. 120 | 5 | 17 or 18 | 12 | 6 | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | 5 | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | 5 | — | |
| — | — | — | — | — | — | — | — | — | — | — | — | 5 | 9 | |
| 23 | 16 | 23 | 50 | 40 | 10 | dext. 18 sin. 17 | 7 | — | 5 | 17 | 11 | 7 | — | |
| — | — | 16 | 44 | — | 8 | 15 | 7 | — | — | — | — | — | — | *labiatus*, Koehl., "Caudan". |
| — | — | 30 | 42 | 42 | 10 | 16 | 7 | — | 5 | — | — | abt. 10 | 12 | *parallelus*, Günth., "Challenger", after Pl. XXIX, fig. A. |
| — | — | — | — | — | — | — | — | — | 5 | 19 | 12 | — | — | *occa*, Goode & Bean, "Albatross". |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| 15.0 | — | — | abt. 32.8 | 30.2 | 10 | 18—19 | 7 | — | 5 | — | — | 4 | 9 | *aratrum*, Gilbert, "Albatross", after the figure. |
| — | 16.1 without spines 13.5 | 13.1 | 31.8 | 34.8 | 9 | 17 | 7 | — | 5 (Between $D_2$ and lat. line) | — | 13 | 3 | — | *doryssus*, Gilbert, "Albatross", after the figure. |

| Total length | Total length: Height of body | Total length: Length of head | Length of head: Height of body | Length of head: Tip of snout to eye | Length of head: Interorbital space | Length of head: Horizontal diam. of eye | Tip of snout to eye: Horizontal diam. of eye | Horizontal diam. of eye: Vertical diam. of eye | Horizontal diam. of eye: Interorbital space | Vert. diam. posterior nostril: Vert. diam. anter. nostr. | Tip of snout to eye: Postorbital part of head | Total length: Tip of snout to anus | Tip of snout to anus: Length of head | Barbel to anus: Length of head | Total length: Tip of snout to $D_1$ | Total length: Tip of snout to ventral | Height of body: The longest ray in $D_1$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | |
| 370 | 8.22 | 3.78 | 2.18 | 2.18 | 4.45 | 3.63 | 1.67 | — | 1.23 | abt. 3 | 1.52 | — | — | — | — | — | 1.25 | *talismani*, Collett, "Travailleur" and "Talisman". |
| 110 | — | — | — | — | — | — | 1.63 | — | — | — | — | — | — | — | — | — | — | |
| 120 | 10.0 | 4.29 | 2.33 | 2.15 | 4.52 | 3.50 | 1.63 | 1.29 | 1.29 | — | — | 3.00 | 1.43 | — | 3.81 | 3.75 | — | *talismani*, Collett, "Michael Sars" 1902. |
| 125 | — | — | — | — | — | — | 1.56 | — | — | — | — | — | — | — | — | — | — | |
| 130 | 9.29 | 4.33 | 2.14 | 2.22 | 4.29 | 3.45 | 1.55 | 1.24 | 1.24 | — | — | 3.10 | 1.40 | — | 3.82 | 3.66 | — | |
| abt. 172 | 8.19 | 3.66 | 2.24 | 2.35 | 4.70 | 3.35 | 1.43 | 1.40 | 1.40 | — | — | 2.53 | 1.45 | — | 3.53 | 3.37 | — | |
| 186 | 9.3 | 3.80 | 2.45 | 2.23 | — | — | 1.57 | — | — | — | — | 2.62 | 1.45 | — | 3.38 | 3.38 | — | |
| 228 | 9.12 | 3.86 | 2 36 | 2.36 | — | — | 1.43 | — | — | — | — | 2.85 | 1.36 | — | 3.51 | 3.51 | — | |
| 100 | — | — | — | — | — | — | 1.61 | — | — | — | — | — | — | — | — | — | — | |
| 110 | — | — | — | — | — | — | 1.71 | — | — | — | — | — | — | — | — | — | — | *talismani*, Collett, "Michael Sars" 1910. |
| 115 | — | — | — | — | — | — | 1.71 | — | — | — | — | — | — | — | — | — | — | |
| 117 | 9.00 | 4.30 | 2.09 | 2.27 | — | 3.53 | 1.43 | 1.28 | — | — | — | 3.08 | 1.40 | — | 4.03 | 3.77 | — | |
| 119 | 9.15 | 3.97 | 2.31 | 2.22 | — | 3.45 | 1.55 | 1.24 | — | — | — | 3.00 | 1.32 | — | 3.50 | 3.50 | — | |
| abt. 150 | 9.39 | 4.05 | 2.31 | 2.22 | 5.44 | 3.7 | 1.67 | 1.25 | 1.47 | 3.63 | 1.52 | 3.06 | 1.33 | 0.84 | 3.66 | 3.66 | — | |
| ( „ 192) | (8.0) | (3.31) | 2.42 | 2.07 | 4.20 | 3.63 | 1.75 | 1.45 | 1.16 | — | — | (2.49) | 1.33 | — | (3.05) | (2.95) | — | |
| „ 210 | — | — | — | — | — | — | 1.88 | — | — | — | — | — | — | — | — | — | — | |
| „ 215 | — | — | — | — | — | — | 1.76 | — | — | — | — | — | — | — | — | — | — | |
| 231 | 8.88 | 3.68 | 2.42 | 2.03 | 4.49 | 3.69 | 1.82 | 1.41 | 1.21 | 2.25 | 1.94 | 2.77 | 1.33 | 0.79 | 3.31 | 3.40 | 1.08 | |
| abt. 242 | — | — | — | — | — | — | 1.75 | — | — | — | — | — | — | — | — | — | — | |
| „ 320 | — | — | — | — | — | — | 1.75 | — | — | — | — | — | — | — | — | — | — | |
| „ 330 | 7.17 | 3.55 | — | — | 4.37 | 3.58 | 1.65 | — | 1.22 | — | 1.61 | — | — | — | — | — | — | |
| „ 410 | 8.2 | 3.80 | 2.16 | 2.08 | 4.70 | 4.15 | 2.00 | 1.37 | 1.13 | 2.25 | 1.73 | 2.73 | 1.39 | 0.85 | 3.42 | 3.39 | 1.00 | |
| 330 | 7.67 | 3.59 | 2.14 | 2.19 | 4.60 | 3.68 | 1.68 | — | 1.25 | — | 1.68 | — | — | — | — | — | — | *labiatus*, Koehler, "Caudan". |
| 405 | 5.78 | 3.26 | 1.73 | 2.37 | 4.17 | 4.17 | 1.76 | 1.32 | 1.00 | 3,5 | 1.21 | 2.19 | 1.53 | 1.07 | 3.09 | 2.98 | 1.67 | *parallelus*, Günther, "Challenger", after Pl. XXIX, fig. A. |
| 305 | 6.93 | 3.47 | 2.00 | 2.00 | 4.00 | 4.00 | 2.00 | [1.5] | 1.00 | [2.38] | [1.56] | [2.48] | [1.52] | [0.95] | [3.51] | [3.08] | [1.50] | *occa*, Goode & Bean, "Albatross", the proportions in [ ] calculated after the figures. |
| 450 | 6.93 | 3.49 | 1.98 | 2.02 | 4.03 | 4.03 | 2.00 | 1.0 | 1.00 | — | — | — | — | — | — | — | — | *occa*, Goode & Bean. |
| 313 | 8.39 | 4.54 | 1.84 | 2.42 | 3.98 | 3.98 | 1.64 | 1.66 | 1.00 | — | 1.19 | 3.28 | 1.39 | 0.91 | 3.96 | 4.20 | 1.14 | *aratrum*, Gilbert, "Albatross", after the figure. |
| 345 | 6.95 | 3.19 | 2.2 | 2.39 | — | 4.25 | 1.78 | 1.74 | — | 4.05 | 1.20 | 2.38 | 1.33 | 0.82 | 2.97 | 3.0 | 1.56 | *doryssus*, Gilbert, "Albatross", after the figure. |

pectoral fin is of the same length as the postorbital portion of the head. It is longer in *talismani*. On the other hand, it is longer than the ventral fin, whereas in *talismani*, this fin is longer than the pectoral.

In *Coelorhynchus occa*, GOODE and BEAN (No. 37, pag. 400, figs. 332, 333, 337), the head is somewhat larger than in the case of *talismani*, going $3^1/_2$ times into the total length, whereas in *talismani*, it is contained from $3^1/_2$ to $4^1/_3$ times in the total length.

The longitudinal diameter of the eye is equal to the interorbital distance. The barbel is longer, amounting to $^1/_4$ the length of the snout as against only $^1/_6$ in *talismani*.

The ventral fin is situate under the centre of the 1st dorsal fin; not, as in *talismani*, on a level with its first ray.

In *Coelorhynchus aratrum*, GILBERT (No. 31, pag. 674, fig. 264), the body is slightly higher in proportion to the length of the head than in *talismani*, the proportion between height of body and length of head being as 1 : 1.84 in the case of *aratrum*, and 1 : 2.09—1 : 2.45 in that of *talismani*.

The length of the eye is equal to the interorbital distance. The eye is more oval. The proportion between the vertical and horizontal diameters of the eye is in *aratrum* 1 : 1.66 or 1.7; in *talismani* 1 : 1.24—1.45.

The position of the fins in *aratrum* is different from that found in *talismani*. The ventral fins are situate right under the pectoral fins, in front of the 1st dorsal; not, as in *talismani*, on the same vertical line as this or slightly in rear. The 2nd dorsal fin commences at the same level as the anal fin, whereas in *talismani* it commences just above the anus, *i. e.* farther forward. The distance between the two dorsal fins is less in *aratrum* than in *talismani;* in *aratrum* it is equal to the base of the 1st dorsal, not counting the two first rays; in *talismani* it is greater than the whole base of the 1st dorsal fin. There are also but 4 series of scales between the two dorsal fins in *aratrum*.

In *Coelorhynchus doryssus*, GILBERT (No. 31, pag. 675, pl. 94) the lateral contours of the snout are straight, the longitudinal diameter of the eye is equal to the interorbital distance, and the proportion between the vertical and horizontal diameters of the eye is as 1 : 1.6 or 1.74. The first dorsal fin, the pectoral and the ventral fins are placed just one above another. The distance between the two dorsal fins is as great as the base of the first dorsal minus its two first rays, and there are only three series of scales between the two dorsal fins.

After these comparisons it may be repeated that *parallelus, occa, aratrum* and *doryssus* must be maintained as species separate, whereas *labiatus* should in all probability be taken as one with *talismani*.

Now ROULE (No. 79 b, pag. 20) in Bulletin de l'institut oceanographique published $^{20}/_5$ 1916 has proposed the name *Coelorhynchus vaillanti* but it seems more correct to keep the name *C. talismani* given by COLLETT in 1905.

### *Macrurus (Coelorhynchus) coelorhynchus,* Risso.

1832—41. *Macrurus coelorhynchus,* (Risso), Bonaparte (No. 5, text).
*Macrourus mysticetus,* (Aldrovandi), Bonaparte (No. 5, plate).
1875. *Macrurus coelorhynchus,* (Risso), Collett (No. 9, pag. 129).
1887. „ „ „ Günther (No. 43, pag. 128).
1888. „ „ „ Vaillant (No. 86, pag. 247, pl. XXI, fig. 3).
1895. *Coelorhynchus atlanticus,* (Lowe), Goode & Bean (No. 37, pag. 397).
1895. *Macrurus coelorhynchus,* (Risso), Smitt (No. 82, II, pag. 585, fig. 139).
1896. „ „ „ Koehler (No. 57, pag. 491).
1905(06). „ *caelorhynhus,* „ Holt & Byrne (No. 47, pag. 24).
1911. *Coryphænoides coelorhynchus,* (Risso), Grieg (No. 38, pag. 24, pl. 1, figs. 5, 6).
1911. *Macrurus atlanticus,* (Lowe), Zugmayer (No. 92, pag. 129).

9 specimens, 3 of them measured 30—38 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

This species is well known and described; it will therefore suffice here to give some measurements of one of the specimens.

| | | |
|---|---|---|
| Total length | 384 | mm. |
| Height of body immediately in front of D.$_1$ | 63 | „ |
| Length of head | 97 | „ |
| Length of snout | 28 | „ |
| Horizontal diameter of eye | 32 | „ |
| Vertical diameter of eye | 24 | „ |
| Interorbital distance | 195 | „ |
| Distance between point of snout and D.$_1$ | 102 | „ |
| „ „ „ „ D.$_2$ | 158 | „ |
| „ „ „ „ A. | 142 | „ |
| „ „ „ „ P. | 95 | „ |
| „ „ „ „ V. | 105 | „ |

The first dorsal fin has 8 rays, the pectoral fin 20 and the ventral 7.

In the lateral line there are about 102 scales; in an oblique line from D.$_1$ to the lateral line 5; between the lateral line and the anus 16. The present specimen is a ♀ with ovaries well developed. The other, measuring 384 mm. was also a ♀; its stomach contained *Euphausiidæ* and *Isopoda*.

***Macrurus sclerorhynchus,*** Valenciennes.

1836—44. *Macrourus sclerorhynchus,* Valenciennes (No. 87, pag. 80, pl. XIV, fig. 1).
1879. *Macrurus* „ ( „ ) Vinciguerra (No. 89, pag. 14, pl. II).
1888. „ „ ( „ ) Vaillant (No. 86, pag. 237, pl. XXII, fig. 2).
1896. „ „ ( „ ) Collett (No. 13 b, pag. 78).

1 specimen, 32.5 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

This species resembles mostly *güntheri* and *æqualis*. It is best distinguished from the former by the fact that the vent is situate slightly in front of the anus, and from the latter by the scales. The eye goes about $2^1/_2$ times into the head, and is slightly larger than or equal to the snout. The mouth commences under the first nostril. The barbel is thin.

The back slopes slightly upward in continuation of the neck towards the first dorsal fin. The height of the body over the pectoral fin goes about $1^1/_5$ times into the length of the head. The long spine in the first dorsal fin has a filiform prolongation, and is armed with pointed teeth set wide apart. The pectoral fin is situate immediately in front of the first dorsal, the ventral fin just under the commencement of the latter; according to VALENCIENNES it has 5 rays (No. 87, pag. 81), but VINCIGUERRA gives 8 (No. 89, pp. 14, 16); VAILLANT (No. 86, p. 237) and COLLETT 9 (No. 13 b, p. 79). The "Michael Sars" specimen has 10. Its outermost prolonged ray reaches to about the 8th anal ray. The anus is slightly in front of the anal fin, below the first dorsal.

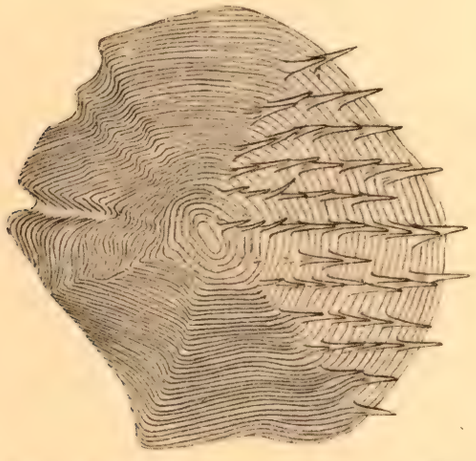


Fig. 17. *Macrurus sclerorhynchus,* Val., 32.5 cm. Scale between second dorsal and lateral line (× 19.5).

The scales are armed with spines set in up to 12 series with ten or more spines in the median (fig. 17). The spines are short and sharp, but broad at the base, which is distinctly radial. Along the lateral line there are 2-3 series of spines on either side, with up to 5 spines in that nearest the groove. The series on the small scales of the neck, where the spines are closely set, have the appearance of keels (fig. 18).

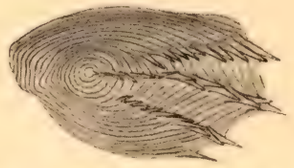


Fig. 18. *Macrurus sclerorhynchus,* Val., 32.5 cm. Scale from the neck (× 19.5).

| | | |
|---|---|---|
| Total length | 325 | mm. |
| Height of body at pectoral | 40 | „ |
| Length of head | 49 | „ |
| Tip of snout to eye | 16 | „ |
| Tip of snout to mouth | 14 | „ |
| Horiz. diam. of eye | 16 | „ |
| Length of barbel | abt. 10 | „ |
| Tip of snout to first dorsal | 56 | „ |
| Tip of snout to pectoral | 54 | „ |
| Tip of snout to anus | 70 | „ |
| Tip of snout to anal | 78 | „ |

| | |
|---|---|
| Length of head: Height of body | 1.23 |
| Length of head: Length of eye | 3.06 |
| Tip of snout to eye: Horiz. diam. of eye | 1.00 |
| Tip of snout to eye: Tip of snout to mouth | 1.14 |
| Station | 25 |

***Macrurus æqualis,*** Günther.

Pl. II, fig. 1.

1887. *Macrurus æqualis,* Günther (No. 43, pag. 134, pl. XXXII, fig. C).
1888. „ *smiliophorus,* Vaillant (No. 86, pag. 242, pl. XXII, fig. 1).
1888. „ *æqualis,* (Günther), Vaillant (No. 86, pag. 386).
1896. „ „ ( „ ), Collett (No. 13 b, pag. 75, pl. II, fig. 9).
1911. „ *æqualis,* (Günther), Zugmayer (No. 92, pag. 126).

160 specimens, 14—30 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

5 specimens, 14—22 cm., St. 23, 5-6/5, N. 35° 32′, W. 7° 7′, 1215 m.

2 specimens, 18.5—21.5 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m.

This species resembles *M. sclerorhynchus,* VAL.; on examination with the lens, however, the difference is immediately apparent; in *æqualis* the scales look as if

covered with small plates, whereas in *sclerorhynchus* the appearance is rather as of small specks.

The eye goes from $2^3/_4$ to $3^1/_5$ times into the head; it is equal to or slightly larger than the snout. The mouth is situate under the first nostril. The barbel is thin.

The back slopes gradually from the neck towards the first dorsal fin, in front of which the rise is most marked. In some specimens, however, the neck rises convexly behind the parietals, and is pressed up into the form of a keel. The dorsal spine is serrate, with teeth straight, and pointing backward.

The pectoral fin is placed before or just above the ventral, both being in front of the first dorsal. The ventral fin has according to the different statements 7—9 rays; the specimens from the "Michael Sars" have 8. Its prolonged ray reaches in one specimen to the anus, in another to the 7th anal ray. The anus is situate far in front of the anal fin. The spines of the scales are lancet-shaped (fig. 19). VAILLANT says that the spines nearest the edge are lancet-shaped, and those inside of similar appearance, but less strongly developed. (No. 86, pag. 244). COLLETT states that the spines are arranged in transverse series (No. 13 b, pag. 76, pl. II, fig. 9 b). On examining the scales of the smallest specimens (figs. 20 & 21), it is at once evident that the spines are arranged in longitudinal series, converging towards the posterior point of the scale, each spine being set a little nearer the longitudinal axis of the scale than the one immediately in front. It will

| Total length cm. (Specimens arranged according to the length of the head) | Height of body at pectoral mm. | Length of head | Snout to eye | Snout to mouth | Horiz. diam. of eye | Length of barbel | Tip of snout to first dorsal | Tip of snout to pectoral | Tip of snout to anus | Tip of snout to anal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 21 | 27 | 7.2 | 7 | 10 | 4 | 32 | 29 | 35 | 41 | 4 |
| 15.5, tip of tail broken, regenerated | 21 | 28.5 | 8.7 | 7.2 | 10 | — | 35 | 29 | 35 | 42 | „ |
| 19, tip of tail broken | 24 | 30 | 9 | 8 | 11 | abt. 4.5 | 35 | 31 | 37 | 44 | 23 |
| 18.5 „ „ „ | 23 | 30 | 9 | 8 | 11 | 4 | 36 | 32 | 40 | 47.5 | 4 |
| 21 | 27 | 32 | 9 | 8.7 | 12 | 6.5 | 39.5 | 34 | 45 | 52 | 23 |
| 20, tip of tail broken | 25 | 33 | 10 | 9 | 12 | — | 39 | 34 | 43 | 50 | 4 |
| 22, not damaged | 26.5 | 33 | 10.2 | 9 | 12 | — | 40 | 35 | 43 | 50 | 23 |
| 18.5, tail broken | 25 | 33.5 | 10.5 | 8.5 | 11.2 | 7 | 42 | 34 | 41 | 49 | 41 |
| 20.5, tip of tail broken | 27 | 33.5 | 10 | 9 | 12 | abt. 4 | 41 | 36 | 45 | 53 | 4 |
| 14, tail broken at the 64th anal ray, where the height of the tail abt. $^1/_2$ cm. | 25 | 34 | 10 | 9 | 12 | abt. 6 | 40 | 35 | 41 | 48 | 23 |
| 21.5, tip of tail broken | 25.5 | 34 | 10 | 9 | 12 | abt. 5 | 41 | 35 | 44 | 52 | 4 |
| 22 | 29 | 34.5 | 10 | 9 | 13.5 | 6 | 41 | 36 | 46 | 54 | „ |
| 23, broken | 29.5 | 38 | 11.5 | 10 | 13.5 | 4.5 | 45 | 41 | 51 | 58 | „ |
| 21.5, tip of tail broken | 29 | 39 | 12.5 | 10 | 13 | 7 | 46 | 40 | 45 | 58 | 41 |
| 24 „ „ „ | 32 | 39 | 12 | 9.5 | 13.5 | 6 | 46 | 41 | 50 | 58 | 4 |
| 24, broken | 33 | 40 | 12 | 10 | 14 | 6 | 47 | 42 | 52 | 60 | „ |
| 24.5, tip of tail broken | 33 | 41 | 11 | 10.5 | 14.5 | 7 | 47 | 44 | 55 | 67 | „ |
| 26, broken | 34 | 42 | 13.2 | 11 | 13.2 | 6 | 49 | 45 | 56 | 65 | „ |
| abt. 18, length of body 16.5 cm.; regenerated at the 60th anal ray, where the height of the tail is 1 cm. | 35 | 42 | 12 | The snout damaged | 13.5 | 9 | 51 | 44 | 55 | 65 | 23 |
| 21, length of the body 19 cm.; regenerated at the 65th anal ray, where the height of the tail is abt. 1 cm. | 33 | 42 | 12 | 10 5 | 14.5 | 8 | 49 | 46 | 62 | 70 | „ |
| 26.5, tip of tail broken | 33.5 | 42 | 12 | 10.5 | 14.7 | — | 50 | 44 | 59 | 72 | 4 |
| 27, broken | 37 | 43 | 12 | 10.5 | 15 | 8 | 53 | 47 | 57 | 67 | „ |
| 27 | 36 | 43 | 12 | 11 | 15 | 6.5 | 54 | 45 | 58 | 70 | „ |
| 26.5, tip of tail broken | 35 | 43.5 | 13 | 12 | 15 | abt. 7 | 52 | 45 | 60 | 65 | „ |
| 27 „ „ „ | 38 | 44 | 12.7 | 12 | 15.5 | 8 | 53 | 46 | 59 | 70 | „ |
| 27.5, tail broken | 36 | 45 | 13 | 11 | 17 | 7 | 57 | 48 | 57 | 72 | „ |
| 28.5, broken | 37 | 46 | 13.5 | 11.5 | 16.2 | 7 | 59 | 49 | 63 | 74 | „ |

also be seen that the earliest developed spines are almost awlshaped. The central portion of the older scales has therefore awlshaped spines with intervals between the rows, whereas the lancet-shaped spines outside the centre are placed close together.

Fig. 19. *Macrurus æqualis*, Günth., 21 cm. regen. Length of head 42 mm. Scale between $D_2$ and lateral line (× 19.5),

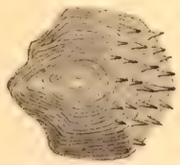


Fig. 20. *Macrurus æqualis*, Günth., 18 cm. Scale from the side before $D_1$ (× 19.5).

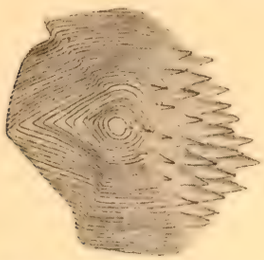


Fig. 21. *Macrurus æqualis*, Günth., 18 cm. Scale below $D_2$ (× 19.5).

In the other *Macruridæ*, the question of colour has not been touched upon; here however, this can be done, as a colour sketch was taken on board, in addition to which the colour has lasted well. The ground tone is grey, with a slight touch of violet and a silvery sheen. The gill cover is almost black, and the body in front of the second dorsal fin bluish, being darkest ventrally. The fins are light grey.

Several specimens from 25—30 cm. were mature females. The ovary matures gradually, not all the ova at once. The clear ovarial eggs have a thin membrane, with a pale yellow oil globule measuring 0.36 mm. whereas the egg itself measures 1.28 mm.

| Total length cm.; arranged according to length of head. See table of measurements | Length of head: Height of body | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Tip of snout to eye: Tip of snout to mouth | Station |
|---|---|---|---|---|---|
| 18 ..... | 1.29 | 2.7 | 0.72 | 1.03 | 4 |
| 15.5 (broken) ... | 1.36 | 2.85 | 0.87 | 1.21 | „ |
| 19 „ ... | 1.25 | 2.72 | 0.82 | 1.12 | 23 |
| 23 ..... | 1.30 | 2.71 | 0.82 | 1.13 | 4 |
| 21 ..... | 1.19 | 2.66 | 0.75 | 1.03 | 23 |
| 20 (broken) ... | 1.32 | 2.75 | 0.83 | 1.11 | 4 |
| 22 (perfect) ... | 1.25 | 2.75 | 0.85 | 1.13 | 23 |
| 18.5 (broken) ... | 1.34 | 2.99 | 0.94 | 1.24 | 41 |
| 20.5 „ ... | 1.24 | 2.79 | 0.83 | 1.11 | 4 |
| 14 „ ... | 1.36 | 2.84 | 0.83 | 1.11 | 23 |
| 21.5 „ ... | 1.33 | 2.83 | 0.83 | 1.11 | 4 |
| 22 ..... | 1.19 | 2.56 | 0.74 | 1.11 | „ |
| 23 (broken) ... | 1.29 | 2.81 | 0.85 | 1.15 | „ |
| 21.5 „ ... | 1.34 | 3.00 | 0.96 | 1.25 | 41 |
| 24 „ ... | 1.22 | 2.88 | 0.89 | 1.27 | 4 |
| 24 „ ... | 1.21 | 2.86 | 0.86 | 1.20 | „ |
| 24.5 „ ... | 1.24 | 2.82 | 0.76 | 1.05 | „ |
| 26 „ ... | 1.24 | 3.18 | 1.0 | 1.2 | „ |
| 18 (regen.) ... | 1.20 | 3.11 | 0.89 | — | 23 |
| 21 „ ... | 1.27 | 2.90 | 0.83 | 1.14 | „ |
| 26.5 (broken) ... | 1.20 | 2.86 | 0.82 | 1.14 | 4 |
| 27 „ ... | 1.16 | 2.86 | 0.80 | 1.14 | „ |
| 27 ..... | 1.19 | 2.87 | 0.80 | 1.09 | „ |
| 26.5 (broken) ... | 1.24 | 2.90 | 0.87 | 1.08 | „ |
| 27 „ ... | 1.16 | 2.84 | 0.82 | 1.06 | „ |
| 27.5 „ ... | 1.25 | 2.65 | 0.77 | 1.18 | „ |
| 28.5 „ ... | 1.24 | 2.84 | 0.82 | 1.17 | „ |

### ***Macrurus zaniophorus,*** Vaillant.

1888. *Macrurus zaniophorus,* Vaillant (No. 86, pag. 245, pl. XXII, figs. 4, 4 a).

4 specimens, 17—30.5 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

This species is recognisable at the first glance by the high back, the prominent position of the mouth immediately behind the point of the snout, and the strong barbel. Otherwise, as in many other *Macruridæ*, the scales furnish the safest characteristics.

The eye goes about $2^4/_5$ times into the length of head, and is larger than the snout. The mouth commences considerably nearer the point of the snout than the eye, its distance from the point of the snout being about half that of the eye from the same. The barbel is not particularly long, but is remarkable for its thickness.

The back curves up behind the neck towards the first dorsal fin. The height of the body is approximately

equal to the length of the head. The dorsal spine is serrated and armed with rearward curving teeth, the last five of these are straighter.

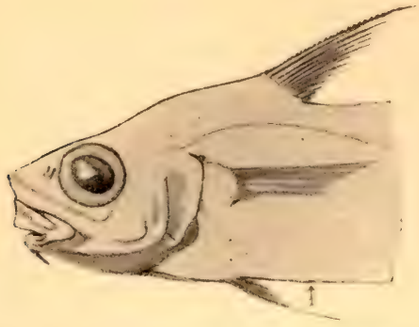


Fig. 22. *Macrurus zaniophorus*, Vaill., 26 cm. (1/2).

The pectoral fin is situate in front of the first dorsal; the ventral beneath the pectoral. The ventral fin has, according to VAILLANT, 8 rays, whereas the "Michael Sars" specimens have 9—10. The outer filiform ray reaches in one specimen to the anal fin, in another to the 7th ray of same. The anus is situate immediately in front of the anal fin.

The appearance of the scales corresponds to that shown in VAILLANT's figure (No. 86, pl. XXII, figs. 4, 4 a). The spines are set, roughly speaking, in oblique transverse series, the spines in one series placed opposite the intervals in the next. They are long, those of the two or three outermost rows extending beyond the edge; their radial base is continued in ridges up the spines themselves. In a fish of 30 cm. there were 13 spines on either side in the inner row on a scale taken from below the commencement of the second dorsal fin. The scales of the lateral line have numerous spines on either side of the groove; in the same fish and at the same place as just mentioned there were 7 spines in the innermost row.

| Total length cm.; arranged according to length of head | Height of body at pectoral mm. | Length of head | Tip of snout to eye | Tip of snout to mouth | Horiz. diam. of eye | Length of barbel | Tip of snout to first dorsal | Tip of snout to pectoral | Tip of snout to anus | Tip of snout to anal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 (tail brok.) | 30 | 37 | 11 | 5 | 13 | 6.5 | 48 | 40 | 57 | 60 | 41 |
| 23 ..... | 37 | 42.5 | 12 | 5.5 | 15 | 6.5 | 53 | 46.5 | 65 | 68 | „ |
| 26 (regen.) .. | 50 | 52 | 15 | 7.5 | 19 | 9 | 69 | 58 | 84.5 | 87 | „ |
| 30.5 ..... | 50 | 55 | 16.5 | 7.5 | 19 | 8.5 | 71 | 60 | 87 | 89 | „ |

| Total length cm. | Length of head: Height of body | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Tip of snout to eye: Tip of snout to mouth | Station |
|---|---|---|---|---|---|
| 17 (tail broken). | 1.23 | 2.85 | 0.85 | 2.2 | 41 |
| 23 ..... | 1.15 | 2.83 | 0.80 | 2.18 | „ |
| 26 (regen.) ..... | 1.04 | 2.74 | 0.79 | 2.0 | „ |
| 30.5 ..... | 1.10 | 2.89 | 0.87 | 2.2 | „ |

***Macrurus güntheri,*** Vaillant.

1887. *Macrurus sclerorhynchus,* Günther (nec Valenciennes), (No. 43, pag. 133, pl. XXXII, fig. A).
1888. „ *holotrachys,* Vaillant (nec Günther), (No. 85 pag. 241, pl. XXII, fig. 3).
1888. „ *guentheri,* Vaillant (No. 86, pag. 386, pl. XXII, fig. 3).
1896. „ *güntheri* (Vaillant), Collett (No. 13 b, pag. 80, pl. III, fig. 10).
1905 (09). *Coryphænoides (Macrurus) güntheri,* (Vaillant), Collett (No. 14, pag. 56).
1906. *Macrurus sclerorhynchus,* Brauer (nec Valenciennes), (No. 8, pag. 205).
1919. *Macrurus Güntheri* (Vaillant), Roule (No. 79 c, pag. 79).

5 specimens, 30—36 cm., St. 25, 8/5, N. 35° 46′ W. 8° 16′, 2055 m., yellow mud.

1 specimen, 38 cm., St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

30 specimens, 30—39 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

66 specimens, 27—48 cm., St. 101, 6-7/8, N. 57° 41′, W. 11° 48′, 1853 m.

This species was at first confused by GÜNTHER with *M. sclerorhynchus*, but VAILLANT saw the error, and named the species *güntheri*. Since then, COLLETT has also described it, and pointed out certain differences between it and *sclerorhynchus*. *Macrurus güntheri* is best characterised by the proportion of the eye to the length of head and to the snout, as also by the scales. The eye goes from 3 to 4 times into the length of head; on an average 3 1/2, and is slightly smaller than or equal to the snout. Only in a single one of the specimens examined was the eye slightly larger than the snout. The spines on the scales are comparatively long, and are not very closely set (fig. 23), amounting as a rule to less than 10 in each longitudinal series. In contrast to this, the eye in *M. sclerorhynchus* goes only about 2 1/2 times into the length of head, viz. from 2.46 to 2.86, and is larger than or equal to the snout. The spines on the scales are in *M. scle-*

*rorhynchus* comparatively short, and lie one close above the next, so that the longitudinal series nearest the centre of the scale may often contain over 10 spines.

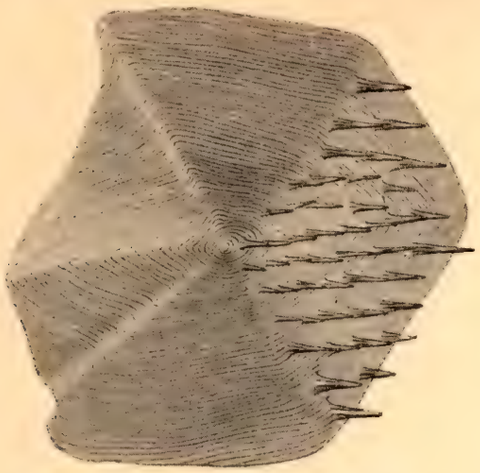


Fig. 23. *Macrurus güntheri,* Vaill., 36 cm. Scale between $D_2$ and lat. line (× 15).

To *Macrurus güntheri,* VAILLANT, belong:

The specimen from the "Challenger", described by GÜNTHER as *M. sclerorhynchus,* but ascribed by VAILLANT to his new species *güntheri.*

The 4 specimens from the "Travailleur" and "Talisman", first described by VAILLANT under the name of *M. holotrachys,* but later named by him *güntheri.*

One specimen taken by the "Hirondelle", described by COLLETT.

One specimen from the "Valdivia", described by BRAUER as *M. sclerorhynchus.*

One specimen from the cruise of the "Michael Sars" in the Faroe channel 1902, described by COLLETT.

The above mentioned specimens from the "Michael Sars" expedition 1910.

Probably two specimens taken by the "Princesse Alice", mentioned by ROULE.

To *Macrurus sclerorhynchus,* VALENCIENNES, belong:

The type specimen of the species, described by VALENCIENNES in WEBB'S and BERTHELOT'S "Histoire naturelle des isles canaries."

The specimen described by VINCIGUERRA, taken outside Genoa.

The 331 specimens taken by the "Travailleur" and "Talisman" described by VAILLANT.

One specimen taken by the "Hirondelle", described by COLLETT.

One specimen from the "Michael Sars" expedition 1910.

The contrast mentioned above between the two species will best be seen from a comparison of the characters concerned.

*Macrurus güntheri,* Vaillant.

| Specimens from: | Length of head: Length of eye | Length of snout: Length of eye |
|---|---|---|
| "Challenger" | 3.50 | 1.00 |
| "Travailleur & Talisman" | 3.56 | 1.11 |
| "L'Hirondelle" | 3.66 | 1.11 |
| "Valdivia" | 3.88 | 1.12 |
| "Michael Sars" 1902 | 3.64 | 1.00 |
| „ „ 1910 | 3.18 | 0.92 |
| | 4.06 | 1.33 |

*Macrurus sclerorhynchus,* Valenciennes.

| Specimens from: | Length of head: Length of eye | Length of snout: Length of eye |
|---|---|---|
| Valenciennes | abt. 2.5 | abt. 0.67 |
| Vinciguerra | 2.64 | 0.68 |
| "Travailleur & Talisman" | 2.86 | 0.86 |
| "L'Hirondelle" | 2.46 | 0.73 |
| "Michael Sars" 1910 | 3.06 | 1.00 |

With regard to the scales, a lens of no great power will enable one to distinguish the two species one from another. In *M. güntheri,* it is immediately apparent that the scales are armed with rearward curving spines; in *sclerorhynchus,* the scales appear to be covered with numerous spots serially arranged. In *M. güntheri,* the spines on the scales of the neck (fig. 24) and in front of the first dorsal fin are extremely long, and often slightly curved. In the remaining parts of the body, the spines are set in 8—12 very distinct longitudinal series, with rarely more than 8 spines in the median. The scales of

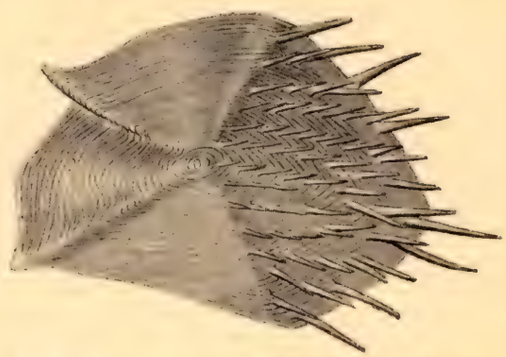


Fig. 24. *Macrurus güntheri,* Vaill., 36 cm. Scale from the neck (× 15).

| Total length cm.; arranged according to the length of the head | Height of body at pectoral mm. | Length of head | Tip of snout to eye | Tip of snout to mouth | Horiz. diam. of eye | Length of barbel | Tip of snout to first dorsal | Tip of snout to pectoral | Tip of snout to anus | Tip of snout to anal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30.2 (perfect) | 33 | 51 | 16 | 11.5 | 16 | 7 | 59 | 55 | 81 | 85 | 101 |
| 31 „ | — | 54 | 18 | — | 15 | — | — | — | — | — | 95 |
| 31 (nearly perfect) | 37 | 54.5 | 18 | 11.5 | 15 | abt. 6 | 64 | 58 | 88 | 92.5 | 101 |
| 28.5 (regenerated) | — | 54.5 | 18 | — | 15 | — | — | — | — | — | „ |
| 27 „ | — | 55 | 18 | — | 16 | — | — | — | — | — | „ |
| 28 „ | 41 | 55 | 18 | 11.2 | 16 | 8 | 67 | 63 | 90 | 99 | „ |
| 31 | — | 55 | 18 | — | 15 | — | — | — | — | — | „ |
| 31.5 (perfect) | 38 | 55 | 19 | 12.5 | 14 | 7 | 63 | 59 | 92 | 96 | „ |
| 34.5 | — | 55 | 17.3 | — | 15.5 | — | — | — | — | — | „ |
| 33.5 (perfect) | 41 | 55.5 | 17 | 12 | 16 | 6 | 63.5 | 58 | 94 | 98 | „ |
| 31 „ | — | 56 | 18 | — | 16 | — | — | — | — | — | 95 |
| 31.5 (regenerated) | — | 56 | 19 | — | 16 | — | — | — | — | — | „ |
| 33 | — | 56 | 21 | — | 19 | — | — | — | — | — | 101 |
| 33 | — | 56.5 | 18 | — | 16 | — | — | — | — | — | „ |
| 31 (length of body 29.5 cm. regen. height of caudal ½ cm.) | 44 | 57 | 18 | 12 | 17 | 8.5 | 70 | 64 | 92 | 97 | „ |
| 28 (broken) | — | 57 (smashed) | 19 (smashed) | — | 18 | — | — | — | — | — | „ |
| 34 (perfect) | 41 | 57 | 19 | 13 | 15.5 | 9 | 65 | 61 | 96 | 101 | „ |
| 28 „ | — | 58 | 19 | — | 16 | — | — | — | — | — | „ |
| 33 (tip of tail broken) | 43 | 58 | 19 | 11 | 15 | — | 71 | 62 | 94 | 102 | , |
| 34 (perfect) | — | 58 | 19 | — | 16 | — | — | — | — | — | 95 |
| 27 (regenerated) | — | 59 | 18 | — | 16 | — | — | — | — | — | 101 |
| 30 „ | 41 | 59 | 19 | 14 | 16.5 | — | 69 | 62 | 95 | 98 | 25 |
| 31 „ | — | 59 | 18 | — | 16.5 | — | — | — | — | — | 101 |
| 34 „ | — | 59 | 19 | — | 16 | — | — | — | — | — | „ |
| 29.2 „ | — | 60 | 20 | — | 17 | — | — | — | — | — | „ |
| 35 | — | 60 | 19 | — | 17 | — | — | — | — | — | „ |
| 30.5 | — | 61 | 17.7 | — | 20 | — | — | — | — | — | „ |
| 33 (tip of tail broken) | 41 | 61 | 20 | 13 | 16 | 7 | 73 | 65 | 92 | 100 | „ |
| 33 (regenerated) | — | 61 | 19 | — | 17 | — | — | — | — | — | 95 |
| 34.5 | — | 61 | 20 | — | 15 | — | — | — | — | — | 101 |
| 35 (nearly perfect) | — | 61 | 19 | — | 19 | — | — | — | — | — | 95 |
| 36.5 | 45 | 61 | 19.5 | 14 | 16 | 8 | 72 | 65 | 105 | 110 | 101 |
| 34 (broken) | 41 | 62 | 20 | 12 | 17.2 | 7 | 69 | 65.5 | 99 | 101 | 25 |
| 34 „ | 42.5 | 62 | 20.2 | 14 | 17.5 | 6 | 73 | 69 | 101 | 103 | „ |
| 37 (regenerated) | — | 62 | 19.2 | — | 17.2 | — | — | — | — | — | 101 |
| 28 „ | — | 62.5 | 20 | — | 17.5 | — | — | — | — | — | „ |
| 31 „ | — | 63 | 19 | — | 16 | — | — | — | — | — | „ |
| 32 (broken) | — | 63 | 20 | — | 17.5 | — | — | — | — | — | „ |
| 34.5 (regenerated) | — | 63 | 20.5 | — | 17 | — | — | — | — | — | 95 |
| 35.5 „ | 45 | 63 | 20 | 15.5 | 17 | — | 78 | 66 | 101 | 108 | 101 |
| 36.5 (perfect) | — | 63 | 20.5 | — | 15.5 | — | — | — | — | — | 95 |
| 37 (tip of tail broken) | 48 | 63 | 20.5 | 13.5 | 17 | 7 | 75 | 70 | 108 | 115 | „ |
| 33 (regenerated) | — | 64 | 20 | — | 17.7 | — | — | — | — | — | 101 |
| 37 (perfect) | — | 64 | 21 | — | 17 | — | — | — | — | — | 95 |
| 30 (regenerated) | — | 65 | 22 | — | 17 | — | — | — | — | — | „ |
| 36 (broken) | — | 65 | 21 | — | 17 | — | — | — | — | — | „ |
| 30 (regenerated) | — | 66 | 22 | — | 17 | — | — | — | — | — | „ |
| 32 „ | — | 66 | 21 | — | 19.5 | — | — | — | — | — | 101 |
| 34 „ | — | 66 | 21.2 | — | 18 | — | — | — | — | — | „ |
| 38 „ | — | 66 | 21 | — | 16.5 | — | — | — | — | — | „ |
| 38.5 | — | 66 | 21.5 | — | 17 | — | — | — | — | — | „ |
| 35.5 | — | 67 | 21 | — | 19 | — | — | — | — | — | „ |

| Total length cm.; arranged according to the length of the bead | Height of body at pectoral mm. | Length of head | Tip of snout to eye | Tip of snout to mouth | Horiz. diam. of eye | Length of barbel | Tip of snout to first dorsal | Tip of snout to pectoral | Tip of snout to anus | Tip of snout to anal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 ..... | — | 67 | 21 | — | 21 | — | — | — | — | — | 101 |
| 34.2 (regenerated)..... | — | 67.5 | 20.5 | — | 19.5 | — | — | — | — | — | „ |
| 35 „ ..... | — | 67.5 | 21.8 | — | 18 | — | — | — | — | — | „ |
| 35 ..... | 47 | 68 | 23 | 15 | 19 | 8 | 82 | 72 | 107 | 110 | 25 |
| 34 (regenerated)..... | — | 69 | 22 | — | 18.5 | — | — | — | — | — | 101 |
| 36.5 (perfect)..... | — | 69 | 21 | — | 19 | — | — | — | — | — | 95 |
| 38 ..... | 51 | 70 | 24 | 14.8 | 19.8 | 7 | 88 | 78 | 113 | 117 | 35 |
| 36 ..... | 51 | 72 | 23 | 16 | 21 | abt. 8 | 83 | 77 | 115 | 118 | 25 |
| 40 (regenerated)..... | — | 72 | 22 | — | 20 | — | — | — | — | — | 101 |
| 39.5 „ ..... | 53 | 73 | 22 | 15 | 22 | 13 | 83 | 80 | 121 | 128 | „ |
| 39 (perfect)..... | — | 74 | 24 | — | 20 | — | — | — | — | — | 95 |
| 40.5 (broken)..... | 54 | 79 | 25 | 18 | 21.5 | 10 | 97 | 86 | 121 | 131 | 101 |
| 46 (regenerated)..... | — | 82 | 26 | — | 22 | — | — | — | — | — | „ |
| 48.2 „ ..... | — | 85 | 26.5 | — | 23 | — | — | — | — | — | „ |

| Total length cm.; arranged according to length of head | Length of head: Height of body | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Tip of snout to eye: Tip of snout to mouth | Station |
|---|---|---|---|---|---|
| 30.2 (perfect)... | 1.55 | 3.19 | 1.00 | 1.39 | 101 |
| 31 „ ... | — | 3.60 | 1.20 | — | 95 |
| 31 (nearly perf.) | 1.47 | 3.64 | 1.20 | 1.57 | 101 |
| 28.5 (regen.) ... | — | 3.64 | 1.20 | — | „ |
| 27 „ ... | — | 3.44 | 1.13 | — | „ |
| 28 „ ... | 1.34 | 3.44 | 1.13 | 1.61 | „ |
| 31 ..... | — | 3.67 | 1.20 | — | „ |
| 31.5 (perfect)... | 1.45 | 3.93 | 1.36 | 1.52 | „ |
| 34.5 ..... | — | 3.55 | 1.12 | — | „ |
| 33.5 (perfect)... | 1.35 | 3.47 | 1.06 | 1.42 | „ |
| 31 „ ... | — | 3.50 | 1.12 | — | 95 |
| 31.5 (regen.).... | — | 3.50 | 1.19 | — | „ |
| 33 ..... | — | 2.95 | 1.11 | — | 101 |
| 33 ..... | — | 3.54 | 1.13 | — | „ |
| 31 (perfect)... | 1.30 | 3.35 | 1.06 | 1.50 | „ |
| 28 (broken)... | — | 3.16 | 1.06 | — | „ |
| 34 (perfect)... | 1.39 | 3.68 | 1.23 | 1.46 | „ |
| 28 (broken)... | — | 3.62 | 1.19 | — | „ |
| 33 „ ... | 1.35 | 3.87 | 1.27 | 1.73 | „ |
| 34 (perfect)... | — | 3.63 | 1.19 | — | 95 |
| 27 (regen.) ... | — | 3.69 | 1.12 | — | 101 |
| 30 „ ... | 1.44 | 3.58 | 1.15 | 1.36 | 25 |
| 31 „ ... | — | 3.58 | 1.09 | — | 101 |
| 34 „ ... | — | 3.69 | 1.19 | — | „ |
| 29.2 „ ... | — | 3.53 | 1.18 | — | „ |
| 35 ..... | — | 3.53 | 1.12 | — | „ |
| 30.5 ..... | — | 3.18 | 0.92 | — | „ |
| 33 (broken)... | 1.49 | 3.81 | 1.25 | 1.54 | „ |
| 33 (regen.) ... | — | 3.59 | 1.12 | — | 95 |
| 34.5 ..... | — | 4.06 | 1.33 | — | 101 |
| 35 (perfect)... | — | 3.21 | 1.00 | — | 95 |
| 36.5 „ ... | 1.36 | 3.81 | 1.22 | 1.39 | 101 |
| 34 (broken)... | 1.51 | 3.60 | 1.16 | 1.67 | 25 |

| Total length cm.; arranged according to length of head | Length of head: Height of body | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Tip of snout to eye: Tip of snout to mouth | Station |
|---|---|---|---|---|---|
| 34 (broken)... | 1.46 | 3.54 | 1.15 | 1.44 | 25 |
| 37 (regen.).... | — | 3.22 | 1.12 | — | 101 |
| 28 „ ... | — | 3.59 | 1.14 | — | „ |
| 31 „ ... | — | 3.94 | 1.19 | — | „ |
| 32 (broken)... | — | 3.60 | 1.14 | — | „ |
| 34.5 (regen.).... | — | 3.70 | 1.21 | — | 95 |
| 35.5 „ ... | 1.25 | 3.71 | 1.18 | 1.29 | 101 |
| 36.5 (perfect)... | — | 4.06 | 1.32 | — | 95 |
| 37 ..... | 1.31 | 3.71 | 1.21 | 1.26 | „ |
| 33 (regen.) ... | — | 3.62 | 1.13 | — | 101 |
| 37 (perfect)... | — | 3.77 | 1.24 | — | 95 |
| 30 (regen.) ... | — | 3.83 | 1.29 | — | „ |
| 36 (broken)... | — | 3.83 | 1.24 | — | „ |
| 30 (regen.) ... | — | 3.88 | 1.29 | — | „ |
| 32 „ ... | — | 3.38 | 1.08 | — | 101 |
| 34 „ ... | — | 3.67 | 1.08 | — | „ |
| 38 „ ... | — | 4.00 | 1.27 | — | „ |
| 38.5 ..... | — | 3.88 | 1.27 | — | „ |
| 35.5 ..... | — | 3.53 | 1.11 | — | „ |
| 36 ..... | — | 3.19 | 1.00 | — | „ |
| 34.2 ..... | — | 3.45 | 1.05 | — | „ |
| 35 ..... | — | 3.75 | 1.21 | — | „ |
| 35 ..... | 1.45 | 3.58 | 1.21 | 1.53 | 25 |
| 34 (regen.).... | — | 3.73 | 1.19 | — | 101 |
| 36.5 (perfect)... | — | 3.64 | 1.11 | — | 95 |
| 38 ..... | 1.37 | 3.53 | 1.21 | 1.62 | 35 |
| 36 ..... | 1.41 | 3.43 | 1.09 | 1.44 | 25 |
| 40 (regen.).... | — | 3.60 | 1.10 | — | 101 |
| 39.5 „ .... | 1.38 | 3.32 | 1.00 | 1.47 | „ |
| 39 (perfect)... | — | 3.70 | 1.20 | — | 95 |
| 40.5 (broken)... | 1.46 | 3.68 | 1.16 | 1.39 | 101 |
| 46 (regen.) ... | — | 3.73 | 1.19 | — | „ |
| 48.2 ..... | — | 3.70 | 1.15 | — | „ |

the lateral line have up to 3 series, each with 1—3 spines, on either side of the median. The base of the spines is distinctly radial, and the spines themselves are more or less long and pointed. Sometimes the spines in the median series may be larger than those in the others, so that the median presents the appearance of a keel. When not worn, the spines are longer in proportion than those of *M. sclerorhynchus*. In this latter, the scales are, as already mentioned, short, and those in each series are set close together, with up to 16 in the median. The scales are not always so characteristic, however, so that it may be difficult to distinguish scales of the one species from those of the other.

In addition to these, the most essential characters, the following should also be mentioned for purposes of comparison with related species. The anterior margin of the mouth lies in front of the nostrils; in *sclerorhynchus* it is beneath the first nostril. In *güntheri* the proportion between the distance of the mouth and that of the eye from point of snout is as 1 : 1.5; whereas in *sclerorhynchus* it is as 1 : 1.1.

The barbel is thin, contrasting with this feature in *M. zaniophorus*. The back continues almost horizontally behind the neck, without any rise up towards the first dorsal fin. The proportion between height of body and length of head is approximately as 1 : 1.4.

The spines of the long ray in the first dorsal fin are in most specimens found to overlap like scales. In some, however, they have their points free, serrate-wise, and are thus drawn by COLLETT (No. 13 b, pl. III, fig. 10) and GÜNTHER (No. 43, pl. XXXII, fig. A). In *sclerorhynchus* the spines are set with small free points, and still wider apart.

The pectoral fin is situate before or immediately under the origin of the first dorsal fin, the ventral fin immediately in front of this, or under its anterior half. Our specimens have 7—8 rays in the ventral fin, GÜNTHER's, VAILLANT's and COLLETT's 7, BRAUER's 8.

The length of the outermost ray in the ventral fin is subject to variation; in some specimens is reaches no farther than the anus; in others as far as the 8th anal ray, as in the *sclerorhynchus* specimen.

The anus is situate behind the first dorsal fin immediately in front of the anal fin, in *sclerorhynchus*, however, it is placed slightly farther forward.

It should also be noted that some of the specimens were found with parasite crustaceans; thus a couple had crustaceans resembling *Anchorella* close to the mouth, and one or two had *Sphyrion* on the back. A specimen from St. 95 had an annelid in the mouth.

In conclusion, the measurements are given on pp. 89-90.

***Macrurus (Coryphænoides) rupestris,*** Gunnerus.

1765. *Coryphænoides rupestris,* Gunnerus (No. 40, pag. 50, pl. III, figs. 1, 2).
1845. *Macrurus strømii,* (Reinhardt), Krøyer (No. 25, pl. 11).
1879. *Coryphænoides rupestris,* Collett (No. 10, pag. 70).
1885. „ „ „ (No. 12, pag. 95).
1887. *Macrurus (Coryphænoides) rupestris* (Gunnerus), Günther (No. 43, pag. 138).
1891. *Coryphænoides rupestris* (Gunnerus), Lilljeborg (No. 61, pag. 259).
1895. *Macrurus rupestris* (Gunnerus), Smitt (No. 82, II, pag. 590, pl. XXVII A, fig. 2).
1895. *Coryphænoides rupestris* (Gunnerus), Goode & Bean (No. 37, pag. 402).
1878—1907. *Coryphænoides rupestris* (Gunnerus), Winther, Hansen & Jensen (No. 91, pag. 95, pl. XI, fig. 3).

24 specimens, 11—90 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

3 specimens, 26—68 cm., St. 70, 30/6, N. 42° 59′, W. 51° 15′, 1100 m.

D.1 II 10, P. 18, V. 8.

Although this species is well known, it will yet be advisable to call attention to certain features and give a picture of the scale for purposes of comparison, with the other *Macruridæ* here mentioned.

The head goes from $4^1/_2$ to 6 times into the total length; this is, however, only approximate, as the total length itself often is uncertain, owing to the tail being broken; between 5 and 6 times would probably come nearest the actual conditions.

The snout forms an obtuse low cone, without projections or keels; seen in profile, the angle of the point of the snout is about 100°. The snout goes from $3^1/_2$ to $4^1/_4$ times into the head. The eye is almost circular, the horizontal diameter is, however, often somewhat greater than the vertical. The horizontal goes roughly between 3 and $3^1/_2$ times into the length of head.

The infraorbital is not prominent, so that the aperture of the eye and the upper jaw are almost on the same plane. The mouth is very large; it commences just in front of the nostrils, and extends to just behind the eye. It is set deep down below the point of the snout; the distance between mouth and point of snout is equal to or only slightly less than that between point of snout and eye, and the mouth being so far forward, the ventral side of the snout is somewhat steep, the line from the point of snout to the mouth coming very near the vertical; its angle with the longitudinal axis of the head is 70°—80°. The teeth in the upper jaw form a narrow villiform band, those of the outermost row being slightly larger than the others; in the lower jaw, those in front are villiform, but the lateral portion has one row only. The barbel is small, as a rule only $^1/_3$ or $^1/_4$ the length of the snout, sometimes slightly

(The total length in cm.; other measurements in mm.).

| Total length cm. | Length of head mm. | Tip of snout to eye | Tip of snout to mouth | Horizont. diam. of eye | Vertical diam. of eye | Interorbital space | Length of barbel | Length of postorbit. part of head | Height at the eye | Height at origin of first dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.7 (tail broken) ..... | 23.5 | 7 | 7 | 8 | 5.2 | 8.8 | — | 11 | 12 | 16 | 4 |
| 18 „ „ ..... | 38 | 10.5 | 11 | 12 | 9.5 | 14.5 | 2.2 | 17.5 | 22 | 28.5 | „ |
| 26 „ „ ..... | 59 | 15 | 15 | 20 | 16.5 | 20 | abt. 4 | 26 | 37 | 46 | 70 |
| 31 (tip of tail broken) | 60 | 17 | — | 18 | 16 | 23 | 4 | 27 | — | 45 | 79 b. 1902 |
| 36 „ „ „ | 77 | 22 | 20 | 24 | 21 | 30 | abt. 5 | 34 | 47 | 61 | 70 |
| 47 (tail broken) ..... | 80 | 21.5 | — | 23 | 22 | 30 | 5 | 39 | — | 65 | 79 b. 1902 |
| 68 „ „ ..... | 120 | abt. 34 | 27 | 38 | 29 | 43 | 11 | 58 | 74 | 103 | 70 |
| 79 (broken) ..... | 129 | 36 | 32 | 36 | 35 | 51 | 12.5 | 67 | 83 | 117 | 4 |
| length of body 77 cm., height at caudal 4 mm. | | | | | | | | | | | |

less or more. The length of the postorbital portion of the head is about equal to half the length of head.

From the point of the snout to the first dorsal fin the height of the body increases gradually, somewhat more markedly in older specimens than in the younger, the upper profile in older fish forming a highly curved arch.

The first dorsal fin commences just behind the vertical of the posterior corner of the gill cover; it has two spines, the first short, the second long and serrate, and ten soft rays; the pectoral fin is placed immediately below, and has 18 rays. A little farther back is the ventral fin, with 8 rays. The anus is placed just under the last ray of the first dorsal fin. Close behind the anus is the commencement of the anal fin, and above its 13—19th ray the second dorsal begins; of these two long median fins the anal fin is the higher.

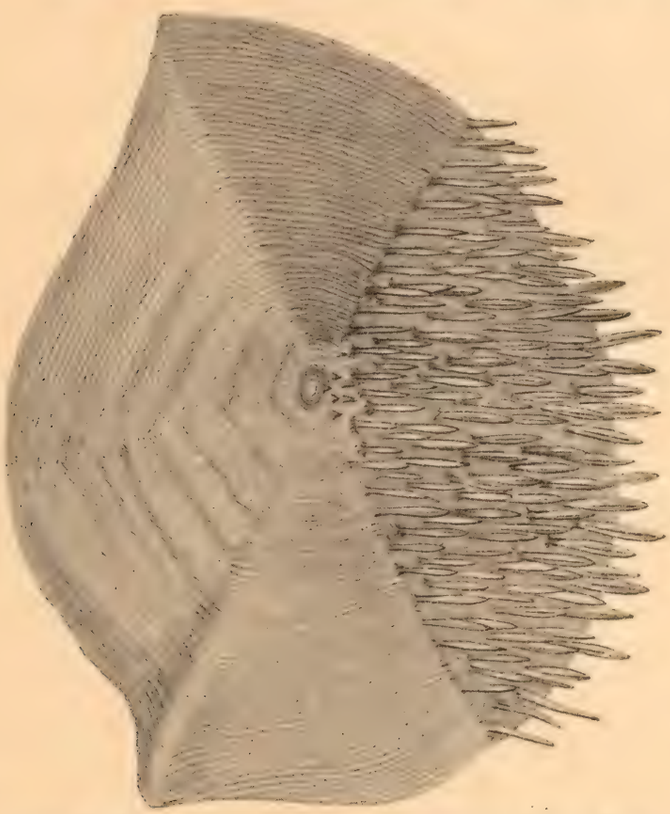


Fig. 25. *Macrurus (Coryphænoides) rupestris,* Gunn., 79 cm. Scale between first dorsal and lateral line (× 15).

Fig. 26. *Macrurus (Coryphænoides) rupestris,* Gunn., 36 cm. Scale between first dorsal and lateral line (× 15).

The scales are imbricate throughout. On the head, the scales form a kind of mosaic pattern; on the body and tail they are set in regular rows. The appearance of the scales is uniform throughout; they are hexagonal, as is usual in *Macruridæ;* the shape varies, however, slightly, according to the part of the body. Thus on the frontals between the eyes they are elongated, with a

| Total length | Total: Length of head | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Horiz. diam. of eye: Vert. diam. of eye | Tip of snout to eye: Length of the barbel | Length of head: Postorb. part of head | Height at eye: Height at first dorsal | Station |
|---|---|---|---|---|---|---|---|---|
| 10.7 | 4.55 | 3.36 | 2.94 | 1.54 | — | 2.14 | 1.33 | 4 |
| 18 | 4.74 | 3.62 | 3.17 | 1.26 | 4.77 | 2.17 | 1.30 | „ |
| 26 | 4.41 | 3.93 | 2.95 | 1.21 | 3.75 | 2.27 | 1.24 | 70 |
| 31 | 5.17 | 3.53 | 3.33 | 1.12 | 4.25 | 2.22 | — | 79 b. 1902 |
| 36 | 4.68 | 3.50 | 3.21 | 1.14 | 4.40 | 2.26 | 1.30 | 70 |
| 47 | 5.88 | 3.72 | 3.48 | 1.04 | 4.30 | 2.05 | — | 79 b. 1902 |
| 68 | 5.66 | 3.53 | 3.16 | 1.31 | 3.09 | 2.07 | 1.39 | 70 |
| 79 | 6.12 | 3.58 | 3.58 | 1.03 | 2.88 | 1.93 | 1.41 | 4 |

great longitudinal diagonal, whereas the vertical axis is greater in the body scales.

The free portion of the scales is closely armed with long backward curving spines (figs. 25 & 26); in smaller fish, as for instance the one of 36 cm. the spines are distinctly set in longitudinal rows, but these slope slightly in towards the middle at the rear, so that the spines in large scales, with the exception of the foremost, and those nearest the centre of the scale, face the intervals between the spines in front. The spines are shaped like narrow lancets, with a keel in the middle and a kind of knife-blade on either side.

None of the specimens taken at St. 4 were mature, but the ovaries contained eggs at different stages of development; most of them small and colourless, but some few large and yellowish brown, so that the whole ovary does not mature at the same time.

***Macrurus asperrimus,*** Vaillant.

Pl. V, fig. 7.

1888. *Coryphænoides asperrimus*, Vaillant (No. 86, pag. 229, pl. XVIII, figs. 2—2 b).
1916. *Trachonurus asperrimus* (Vaillant), Roule (No. 79 b, pag. 21.)
1919. „ „ „ „ (No. 79 c, pag. 82, pl. III, figs. 2 & 2 a).

2 specimens, 22—31 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′ 1365 m., yellow mud.

A remarkable feature is the rough surface of the body, owing to the very prominent spines on the scales; also the small, pointed head, due to the fact that the infra-orbital is only slightly projecting, and finally, the long thin tail.

The profile of the anterior part of the body is somewhat higher than shown in VAILLANT's figure (No. 86, pl. XVIII fig. 2). The middle of the snout is raised in a convexity above the nostrils. The frontals and parietals slope upward, but from the neck, the back curves up towards the first dorsal fin. The height of the body is between $1/7$ and $1/8$ of the total length.

The length of the head is nearly $1/6$ of the total length, the snout about $1/4$ of the length of head; it is short and narrow, $2/3$ of the interorbital breadth, and slightly smaller than the eye. Here it differs from VAILLANT's (No. 86, pag. 229) statement to the effect that the snout goes only $3\,1/2$ times into the length of head, and that it is longer than the eye. The mouth commences in front of the nostrils, and extends to the posterior margin of the eye. The maxilla terminates beneath the posterior margin of the pupil. Although the infraorbital is only slightly prominent, the mouth is nevertheless entirely on the under side of the head. In the upper jaw is a row of comparatively strong teeth outside the villiform armament of smaller teeth. In the lower jaw, the teeth are also set in villiform bands, but are her larger than is usual with such arrangement. The barbel is about half the length of the eye. The aperture of the eye is oval; the longitudinal diameter of the eye goes about $3\,1/2$ times into the length of the head. Interorbital distance slightly greater than length of eye.

The first dorsal fin has 2 spines, with 6 rays in the largest specimen, and 9 in the smallest, all branched. The second spine is smooth, and had a filiform prolongation, which would extend out over $3/4$ of the distance between the two dorsal fins.

Behind the first dorsal fin runs a groove; nothing is visible of the rays in the second dorsal, however, until a distance from the first is reached equal to about 2—3 times the base of the first dorsal fin. The pectoral fin is placed in front of the first dorsal, and has 13—14 rays.

The ventral fin is set beneath the first rays of the first dorsal fin, its rays numbering 7. The first long ray reaches to the 6th anal ray. Between this and the anus there is a bare patch of skin. The distance between isthmus and anus is equal to the length of head minus the snout. The anal fin commences just behind the anus, under the interval between first and second dorsal fin, nearer the latter.

Fig. 27. *Macrurus asperrimus*, Vaill.
31 cm., length of head 52,5 mm.
Scale between $D_1$ and lateral line (× 30).

The scale covering is uniform throughout; the scales are cycloid. The spinous and nude portions are about equal in extent, so that, while the scales overlapping, the spinous part is only separated by grooves from the surrounding scales (fig. 27). In the head, and along the base of the long median fins, however, the spinous portions of the scales predominate. The spines are long and powerful, standing out straight from the surface of the scale, with the points curving slightly back. Their radial base is very strongly developed, as in *M. flagellicauda*. The

Fig. 28. *Macrurus asperrimus*, Vaill.
31 cm., length of head 52,5 mm.
Scale from the series nearest the anal (× 30).

scales along the second dorsal and anal fin are not much larger than those on the remainder of the body; the spines nearest the fins, however, are larger than the average (fig. 28). On the other hand, there may be small round scale plates with a few, from 1 to 5, spines, at the base of the anal rays (fig. 29).

Between first dorsal fin and lateral line there are 7 scales in an oblique series.

The lateral line is almost straight.

These two fish also strongly resemble *Macrurus villosus*, GÜNTHER. Most of the characters which GÜNTHER (No. 43, pag. 142, pl. XXXVI, fig. B) gives for this latter will also be found to apply to them, but *villosus* has a smaller mouth. GÜNTHER says nothing about larger teeth, but merely states "teeth in villiform bands" (No. 43. pag.

Fig. 29. *Macrurus asperrimus*, Vaill.
31 cm., length of head 52,5 mm.
Scale from base of an anal fin ray. (× 30).

143). The second dorsal fin commences immediately behind the first.

On examination of *Macrurus villosus*, GÜNTHER, *asperrimus* VAILLANT, and the two specimens from the "Michael Sars" at the same time, these differences would probably disappear, and all will be found to belong to one and the same species, which must then be called *villosus*. This probability is also supported by BRAUER's (No. 8, pp. 268, 269) and WEBER's (No. 90, pp. 165, 166) measurements of *villosus*, which are therefore given below for purposes of comparison with VAILLANT's *asperrimus* and the two fish from the "Michael Sars". The name of the sub-genus is not given here. According to VAILLANT's system (No. 86, pag. 205) they should be called *Coryphœnoides*, which name VAILLANT also gives them; by GÜNTHER's classsification (No. 43, pag. 124) however, which is here employed, they must be termed *Trachonurus*, as the skin, when viewed under the lens presents the same appearance as in GÜNTHER's figure, although the scales really are imbricate.

After GILBERT and HUBBS (No. 31 a, pag. 206—207) *Trachonurus villosus*, GÜNTHER, differs in the following characters from *Macrurus asperrimus*, VAILLANT, as here described:—

The outer premaxillary series of teeth not enlarged. Scales not imbricate; those along anterior portion of dorsal and anal bases enlarged. The barbel is 6 % of the distance between the snout and the anus against 10.8 % of this distance in *M. asperrimus* from the "Michael Sars". *Trachonurus sentipellis*, GILBERT and CRAMER differs, according to GILBERT

(Total length in cm., other figures are mm.).

| Total length in cm. | Length of head | Tip of snout to eye | Horiz. diam. of eye | Vert. diam. of eye | Interorbital space | Length of barbel | Length of postorb. part of head | Height of body at $D_1$ | Tip of snout to first dorsal | Base of first dorsal | The longest ray in first dorsal | Distance between first and second dorsal | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 (tail broken) | 38 | 10 | 11 | 9.5 | 12 | — | — | 28 | — | 8 | 19 | 14 | "M. S." 1910, St. 41, N. 28° 8′, W. 13° 35′. |
| 31 (tip of tail broken) | 52.5 | 13.5 | 15.2 | 11 | 16.2 | 8 | 24 | 42 | 63 | 7.5 | 25 | 21 | "M. S." 1910, St. 41, N. 28° 8′, W. 13° 35′. |
| 30.1 | 52 | 15 | 13 | — | 16 | — | — | 38 | — | — | — | — | *Coryphænoides asperrimus*, Vaillant. |
| 23.5 | 42 | 11 | 11.5 | — | 16 | 8 | — | 31 | — | — | 32 | 8 | Weber "Siboga" exp., St. 170, S. 3° 37.7′, E. 131° 26.4′. |
| 24.5 | 40 | 11 | 12 | — | 15.5 | 3 | — | 32 | — | — | 18 | 11 | St. 173, S. 3° 27′, E. 131° 0.5′ |
| 24.5 | 44 | 11 | 13 | — | 16 | 5.5 | — | 34 | — | — | 28 | 11 | *Trachonurus villosus*, Günther. |
| 28.5 | 52 | 11.5 | 13 | — | 19 | 6 | — | 40 | — | — | — | 15 | Brauer "Valdivia" exp., St. 207, N. 5° 23′ 2″. E. 94° 48′ 1″, *Trachonurus villosus*, Günther. |

| Total length in cm. | Total length: Length of head | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Length of head: Vert. diam. of eye | Length of head: Interorbital space | Horiz. diam. of eye: Tip of snout to eye | Interorbital space: Horiz. diam. of eye | Horiz. diam. of eye: Length of barbel | Total length: Height of body | Length of head: Height of body | Tip of snout to first dors.: Length of head | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 (tail broken) | 5.80 | 3.80 | 3.46 | 4.00 | 3.16 | 1.10 | 1.09 | — | 7.85 | 1.36 | — | "M. S.", St. 41, N. 28° 8′, W. 13° 35′ |
| 31 (tip of tail broken) | 5.90 | 3.89 | 3.45 | 4.77 | 3.24 | 1.13 | 1.07 | 1.90 | 7.38 | 1.25 | 1.20 | |
| 30.1 | 5.79 | 3.47 | 4.00 | — | 3.25 | 0.87 | 1.23 | — | 7.93 | 1.37 | — | *Coryphænoides asperrimus*, Vaill. |
| 23.5 | 5.60 | 3.82 | 3.65 | — | 2.62 | 1.05 | 1.39 | 1.44 | 7.59 | 1.35 | — | Weber "Siboga" expedition, St. 170, S. 3° 37.7′, E. 131° 26.4′. |
| 24.5 | 6.13 | 3.64 | 3.33 | — | 2.58 | 1.09 | 1.29 | 4.00 | 7.66 | 1.25 | — | St. 173, S. 3° 27′, E. 131° 0.5′. |
| 24.5 | 5.57 | 4.00 | 3.38 | — | 2.75 | 1.18 | 1.23 | 2.36 | 7.20 | 1.29 | — | *Trachonurus villosus*, Günther. |
| 28.5 | 5.49 | 4.52 | 4.00 | — | 2.74 | 1.13 | 1.46 | 2.17 | 7.12 | 1.30 | — | Brauer "Valdivia" expedition, St. 207, N. 5° 23′ 2″, E. 94° 48′ 1″. *Trachonurus villosus*, Günther, |

| Total length in cm. | Length of head in % of total length | Tip of snout to eye in % of length of head | Horiz. diam. of eye in % of length of head | Vert. diam. of eye in % of length of head | Interorb. space in % of length of head | Height of body in % of total length | Material |
|---|---|---|---|---|---|---|---|
| 22 (tail broken)..... | 17.3 | 26.4 | 29 | 25 | 31.6 | 12.7 | „M. S.", St. 41, N. 28° 8′, W. 13° 35′ |
| 31 (tip of tail broken). | 16.9 | 25.7 | 29 | 21 | 30.8 | 13.6 | |
| 30.1 ..... | 17 | 29 | 25 | — | 31 | 12 | *Coryphænoides asperrimus*, Vaill. |

and CRAMER (No. 30, pag. 429, pl. XLV, fig. 1; No. 31, pag. 679) from *villosus*, in having a row of large scales along the anal fin; these, and also some of the scales along the second dorsal fin, being armed with a single oblique row of spines greater than the spines on the ordinary scales of the body. *Trachonurus sulcatus* differs, according to GOODE and BEAN's description (No. 37, pag. 410, fig. 343) from *villosus* in the fact of its lower jaw being armed with but a single row of teeth.

### *Macrurus (Cetonurus) sp.*

Pl. V, fig. 9.

2 specimens, 17—23 cm., the tail, however, is broken. St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

$D_1$ II. 9, P. 16, V. 10.

The appearance of the head is almost spherical, with the snout projecting slightly in front. Its greatest height from the parietals to the lower margin of the gill cover part is to the length of the head as 1 : 1.28.

The eye is oval. Its longitudinal axis slopes obliquely back, parallel with the cleft of the mouth. The height of the eye goes about $1^1/_4$ times into its length and the latter about $3—3^1/_2$ times into the length of the head. The snout is short and broad, its breadth being greater than its length. The length of the snout goes about $2^1/_2—3$ times into the length of the head, and is to its own breadth as 1 : 1.19. Seen from above, the part of the snout in front of the nostrils resembles an obtuse-angled isosceles triangle, the distance from point of snout to the lateral corner in front of the nostrils going about $1^1/_2$ times into the distance between the lateral corners. The nostrils form a circular cutaneous region just in front of the eyes, the foremost being, as usual with the *Macruridæ*, a small round aperture, while the hinder one is crescent shaped. The distance from the point of the snout to the mouth is the same as that to the eyes, but the snout slopes sharply down towards the mouth, so that the mouth commences under the nostrils. The length of the mouth is about equal to that of the eye, so that the cleft of the mouth ends slightly behind the centre of the eye. The teeth form a narrow villiform band. The barbel is very small, about $^1/_5$ the length of the eye. The gill cover is almost hidden under the skin. The lower posterior portion of the head is bounded by the gill opening, which, together with a groove in its continuation behind the neck almost forms a half circle. The boundary of the head in rear, and the length and shape of the snout, agree with *Macrurus (Cetonurus) crassiceps*, GÜNTHER (No. 43, pag. 143, pl. XXXVII). In one of the specimens from the "Michael Sars" the snout is 34 % the length of the head; in the other 37.1 %. In *crassiceps* it is 38.4 % the length of the head, in *Hymenocephalus globiceps*, VAILLANT 30 %. (No. 86, pp. 214, 386, pl. XX, fig. 1). According to VAILLANT, the snout in *globiceps* is domed or rounded and obtuse. It may be seen, however, from the figure, that in *globiceps* also the snout is very broad, and has two lateral corners, though these lie below the nostrils, not just in front of them. The size of the eyes, on the other hand, agrees best with *globiceps*; as a matter of fact, in the specimens from the "Michael Sars" the eyes are relatively larger. The interorbital distance also agrees in *globiceps* and the two specimens from the "Michael Sars". The greatest height of the body is between the neck and the isthmus, as in *crassiceps*, whereas in *globiceps* it is behind the ventral fin. This naturally stands in some relation to the fact that the distance between the point of the snout and the first dorsal fin is less in *crassiceps* and the "Michael Sars" specimens than in *globiceps*. In *crassiceps* the proportion between the distance from point of snout to first dorsal fin and length of head is 1.00; in the "Michael Sars" specimens 1.02—1.08, and in *globiceps* 1.13. As in *crassiceps*, the neck is continued out in a carina up to the first dorsal fin. The base of this fin slopes steeply rearward, so that the fin points straight back. Its position is, however, as in *globiceps*, behind the pectoral and ventral fins, whereas in *crassiceps* it is placed in front of the pectoral fin at the same level as the ventral, almost in the front of the gill aperture. One spine only is visible, this having pointed depressed teeth. VAILLANT says of *globi-*

| Total length | Length of head mm. | Height of head | Length of eye | Height of eye | Tip of snout to eye | Width of snout | Distance from tip of snout to lateral corner of snout | Inter-orbital space | Barbel | Height of body | Tip of snout to first dorsal | Base of first dorsal | Distance between first and second dorsal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 cm., tip of the tail broken | 50 | — | 14 | 11 | 17 | — | — | — | abt. 3 | 38 | — | 8 | 18 |
| 23 „ tail broken ..... | 51 | 40 | 16 | 13 | 19 | 22.5 | 14.7 | 22.2 | „ 3 | 43 | 55 | 10 | 16 |

| Total length | Length of head: Height of head | Length of head: Length of eye | Length of eye: Height of eye | Length of head: Tip of snout to eye | Width of snout: Tip of snout to eye | Width of snout: Distance between tip of snout and lat. corner of snout | Length of eye: Barbel | Tip of snout to first dorsal: Length of head | Distance between first and second dorsal: Base of first dorsal |
|---|---|---|---|---|---|---|---|---|---|
| 17 cm., tail broken ..... | — | 3.58 | 1.27 | 2.94 | — | — | 4.67 | — | 2.25 |
| 23 „ tail broken ..... | 1.28 | 3.18 | 1.23 | 2.68 | 1.19 | 1.53 | 5.33 | 1.08 | 1.60 |

| Total length | Length of eye in % of length of head | Height of eye in % of length of head | Tip of snout to eye in % of length of head | Interorbital space in % of length of head |
|---|---|---|---|---|
| 17 cm., tail broken ..... | 28 | 22 | 34 | — |
| 23 „ tail broken ..... | 31.4 | 25.4 | 37.1 | 43.5 |

*ceps*: Sharp but slightly projecting teeth (No. 86, pag. 215); GÜNTHER states of *crassiceps:* Second dorsal spine indistinctly serrated (No. 43, pag. 143). There is, however, little reason to attach any great importance to this difference; in one of the fish from the "Michael Sars" the teeth are sharp, in the other blunt. Also in other species of *Macruridæ* as for instance *M. flagellicauda,* it has been found that the teeth of the dorsal spine may be sharp in one individual and blunt in another. The 2nd dorsal fin commences above the 14th anal ray, at a distance from first dorsal fin equal to about $1^1/_2$—$2^1/_4$ times the base of the latter. It is low, presenting the appearance of a row of spines along the back. In *globiceps*, the 2nd dorsal fin commences almost above the 8th anal ray, in *crassiceps* above the 11th. The pectoral fin is, both in *globiceps* and *crassiceps*, as also in the "Michael Sars" specimens, equal to the postorbital portion of the head; in *globiceps*, however, it reaches to the 14th anal ray, in the "Michael Sars" specimens to the 10th and in *crassiceps* to the 16th. The distance between isthmus and anus is, as in *crassiceps*, equal to the postorbital portion of the head, whereas in VAILLANT's drawing of *globiceps* it is greater. The anus is situate immediately under the hindmost rays of the 1st dorsal fin, so that the anal fin commences just in rear of the foremost dorsal fin; according to GÜNTHER's and VAILLANT's drawings of *crassiceps* and *globiceps* respectively, it begins midway between the two dorsal fins. Judging from the drawing, the rays in *globiceps* are set far wider apart than in *crassiceps* and the "Michael Sars" specimens, where they are placed, at least as regards the front portion of the fin, close together. The foremost part is in *crassiceps* and the "Michael Sars" specimens more or less concave, so that the lower side of the tail lies in a line with the upper side of the pectoral fin, and the height of the tail a short distance behind the anus is very slight. Albeit there is some difference in this respect between the two specimens from the "Michael Sars", the transition from body to tail is yet far more gradual in VAILLANT's figure of *globiceps*, the concavity of the anal fin less pronounced and the lower side of the tail does not come up on a level with the upper side of the pectoral fin until much farther out. In the upper side of the tail also there appears to be more similarity between *crassiceps* and the

specimens from the "Michael Sars". In these, the back behind the first dorsal fin runs in an almost horizontal line; in *globiceps* it slopes more gradually from the first dorsal fin to the tail. The whole of the body is covered with scales, except the opercular flap, the lips, and round the nostrils. On the head, however, the scales are not

Fig. 30. *Macrurus (Cetonurus) sp.*
23 cm. Length of head 51 mm.
Scale from the head in profile (× 29).

cycloid and imbricate but resemble small plates, placed one beside another, and armed with straight spines (fig. 30). VAILLANT states that the scale covering of head and body is the same, yet his drawing gives the impression that the head scales are laid in mosaic fashion, whereas those of the body overlap. GÜNTHER also states that the head is covered with long-spined or rough scales. His mention of the scales is very brief, but the description of the scale covering in *globiceps* and *crassiceps* agrees in all essentials

Fig. 31. *Macrurus (Cetonurus) sp.*
23 cm. Length of head 51 mm.
Scale between commencement of $D_2$ and lat. line (× 29).
Right side.

with that found in the fish here concerned. The scales of the body and tail are small and of the hexagonal shape common in *Macruridæ*, although this is not very pronounced, as the corners are rounded. Between the concentric ridges of the scale run transverse ridges or bridges. The free portion of the scale is armed with long, slightly curved spines, which, on the body beneath the first dorsal fin, and the commencement of the second, are set in 1—2 series on either side of a median (fig. 31), while farther out on the tail there are three or four series on either side, that is to say, as far as they can be called series at all, when there are but 1—2 spines in each (fig. 32). Along either side of the 2nd dorsal fin runs a furrow without spines. This is due to the fact that the scales in the uppermost series have here only one small spine in the upper half of the spiny field. The lower half, however, has two rows of two spines each, and one spine below these. These

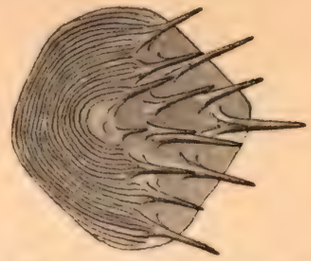


Fig. 32. *Macrurus (Cetonurus) sp.*
23 cm. Length of head 51 mm.
Scale from the tail between $D_2$ and lat. line (× 29).

scales, by the way, are larger than the others, and the curved spines therefore stronger (fig. 33). In addition to this, they scarcely overlap at all, but are set in a small fold of skin round the scale, only the anterior margin lying under the edge of the scales in the same and next lower row immediately in front. The far greater portion of the unarmed field in the scale being thus free, the skin beneath it is pigmented.

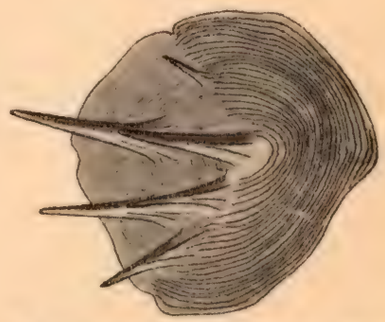


Fig. 33. *Macrurus (Cetonurus) sp.*
23 cm. Length of head 51 mm.
Scale from the first series below $D_2$ (× 29).
Right side.

From the size of the eye and the position of the first dorsal fin relative to the pectoral and ventral, these two fish from the "Michael Sars" should be placed as VAILLANT's *globiceps*, in various other respects, however, they exhibit so great resemblance to GÜNTHER's *crassiceps*, that it will be better to leave the question of species open until direct comparison with the two species in question has been made.

*Cetonurus robustus*, GILBERT and HUBBS (No. 31 a, pag. 207, pl. XI, fig. 2) differs chiefly from these two *Cetonurus* in the smaller eye; the eye goes namely 4—4.5 times into the head (No. 31 a, pag. 208) against 3.2—3.6 times in *Cetonurus* here described.

***Macrurus flagellicauda,*** n. sp.

Pl. V, fig. 8.

4 specimens, ca. 30—40 cm. (tail broken).

St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

This fish strongly resembles *Cetonurus globiceps*. Like this it is rough coated, the scales being furnished with long spines; the scales along the second dorsal fin, however, do not differ from the rest. *M. flagellicauda* is more normal in shape than *globiceps*; the head does not swell out to such a degree of rotundity, and the narrowing of the tail is less abrupt, with a more even transition from the body.

$D_1$. I. 7—9, P. 17, V. 6—7.

The height of the body goes about $8^1/_3$ times into the total length. The tail is long and thin. The head about $7^1/_4$ times into the total length. The snout is short and broad, its breadth greater than its length. It goes from $2^3/_4$ to $3^1/_2$ times into the length of head. The nostrils occupy a round bare part immediately in front of the eyes. The foremost is small, a mere speck, the hinder one crescent shaped. The eye is almost round, and amounts to between $^1/_4$ and $^1/_5$ of the length of the head. The length of the upper jaw is equal to the distance of the mouth from point of snout. The teeth in upper and lower jaw form a narrow villiform band. The barbel is not altogether insignificant, its proportion to the length of the eye being as 1 : 1.17 —1.65. The postorbital portion of the head is equal to the distance from point of snout to centre of eye. The operculum easily distinguishable.

The greatest height of body is over the ventral fins. A little farther back is the first dorsal fin, the base of which turns obliquely rearward. Only one spine is visible; possibly there may be a very small one in front of this but so embedded in the skin, as to be imperceptible. The spine reaches almost to the second dorsal fin. It has sharp depressed teeth, in the one specimen; two of the others have more or less blunt teeth here, while in the fourth specimen they are entirely worn away. The second dorsal fin is quite low. It commences above the 12—18th anal ray, at a distance from the first dorsal fin equal to $2^1/_3$ or 3 times the base of the latter. The pectoral fin is placed in front of the first dorsal, and reaches to the 10th anal ray. The ventral fin again is slightly in front of the pectoral; its outermost ray is prolonged so as to reach as far as the anus. The anus is situate immediately under the first dorsal fin, and the anal fin commences just under its posterior ray. As usual in *Macruridæ*, the rays of the anal fin are considerably longer than those of the second dorsal. The abdominal cavity extends approximately to above the 10th anal ray. The caudal musculature is here on a level with the pectoral fin, but the interspinalia of the anal fin are so long, that the fin does not exhibit any noticeable concavity. The tail is extremely long, and very thin at

Fig. 34. *Macrurus flagellicauda*, n. sp.
30 cm. Length of head 56 mm.
Scale below the space between $D_1$ and $D_2$ (× 45).

the end, presenting the appearance of a whiplash. The scales are now largely destroyed, but there has been uniform scale covering throughout save for the gill cover, lips and nostrils. The spines on the head scales are straight; those

Fig. 35. *Macrurus flagellicauda*, n. sp.
33 cm. Length of head 68 mm.
Scale below the commencement of $D_2$ (× 45).

on the scales of the body slightly curving backwards. The spines run out at their base into marked radial keels, so that the longitudinal series are indistinct, even where it is possible to distinguish any order at all in the arrangement of the spines. The spines are often set alternately from one series to another, a spine in one row corresponding to an interval in that above or below; or the spines are not arranged serially, one in a line with the next in front, but each set

(Total length in cm., other measurements in mm.).

| Total length | Height of body | Length of head | Tip of snout to eye | Breadth of snout | Horizont. diam. of eye | Vertic. diam. of eye | Interorbital space | Length of barbel | Base of first dorsal | Distance between first and second dorsal |
|---|---|---|---|---|---|---|---|---|---|---|
| | mm. | | | | | | | | | |
| 40 cm.; only a little of the tail is lost | 48 | 55 | 19.8 | 22 | 13 | 12 | 22 | 9.5 | 11 | 26 |
| 30 cm.; tail broken | 48 | 56 | 19 | — | 13 | 12 | — | 8 | 10 | 23 |
| | | | | | dext. sin. | | | | | |
| 40 cm.; tail broken | 53 | 63 | 21 | — | 16 14 | 14 | — | 12 | 9.5 | 29 |
| 33 cm.; tail short, broken, the largest specimen | 59 | 68 | 25 | — | 14 | 13 | — | 10 | 11 | 30 |

| Total length | Height of body in % of total | Length of head in % of total | Tip of snout to eye in % of length of head | Horiz. diam. of eye in % of length of head | Vertic. diam. of eye in % of length of head | Interorbital space in % of length of head |
|---|---|---|---|---|---|---|
| 40 cm | 12 | 13.7 | 35.4 | 23.6 | 21.8 | 40 |
| 30 „ | — | — | 34.0 | 23.2 | 21.4 | — |
| 40 „ | — | — | 33.4 | dext. 25.4 | 22.2 | — |
| 33 „ | — | — | 36.8 | 20.6 | 19.1 | — |

| Total length | Total length: Height of body | Total length: Length of head | Length of head: Height of body | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Length of head: Vert. diam. of eye | Horiz. diam. of eye: Vert. diam. of eye | Length of head: Interorbital space | Horiz. diam. of eye: Barbel | Vert. diam. of eye: Barbel | Distance between first and second dorsal: Base of first dorsal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 cm. | 8.34 | 7.27 | 1.15 | 2.78 | 4.23 | 4.58 | 1.08 | 2.50 | 1.37 | 1.26 | 2.36 |
| 30 „ | — | — | 1.17 | 2.95 | 4.31 | 4.67 | 1.08 | — | 1.65 | 1.50 | 2.30 |
| | | | | | | | dext. sin. | | | | |
| 40 „ | — | — | 1.19 | 3.00 | 3.94 | 4.50 | 1.14 1.00 | — | 1.33 | 1.17 | 3.06 |
| 33 „ | — | — | 1.15 | 2.72 | 4.85 | 5.23 | 1.08 | — | 1.40 | 1.30 | 2.72 |

opposite to the interval between the two before it. A magnified view of the spiny part of the scales might be compared with a pine wood, where heavy roots are visible in the surface of the soil (figs. 34 and 35).

### *Macrurus (Chalinura) simulus,* G. & B.

1883. *Chalinura simula,* Goode & Bean (No. 35, pag. 199).
1887. *Macrurus simulus,* (Goode & Bean), Günther (No. 43, pag. 145).
1895. *Chalinura simula,* Goode & Bean (No. 37, pag. 412, fig. 345).
1898. *Macrurus (Chalinura) simulus,* (Goode & Bean), Lütken (No. 66, pag 28).

5 specimens, 31—62 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615—2865 m., yellow hard clayish mud.

2 specimens, 27—34 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., yellow sand and mud.

D 1 II. 7—8, P. 18—19, V. 8—9, A. abt. 115, r. br. 6, scales about $^{7}/_{17}$, 145.

The head is about $^{1}/_{5}$ of the total length. The snout goes from $3^{3}/_{4}$ to 4 times into the length of the head. It is cut off vertically in front, and has a median keel, a

slight keel out over the nostrils to the eye and also a keel in front, running almost at right angles from the point of the snout, and connecting the others. The width of the snout in front is slightly less than its length but equal to the interorbital distance. The eye goes from 5 to 6 times into the length of the head. Its proportion to the snout varies from 1.3 to 1.6, and to the interorbital distance from 1.2 to. 1.5. The eye also goes from 3 to $3^3/_4$ times into the postorbital portion of the head, and is equal to the length of the lateral keel on the snout. The mouth is situate immediately under the point of the snout, and the upper jaw reaches back to the posterior edge of the eye. In the upper jaw there is an outer series of strong teeth, and inside this a villiform arrangement of smaller teeth. Those in the lower jaw are uniserial, they can, however, in the extreme anterior portion, be biserial. The vomer and palatina have no dentition. On the lower side of the mandible there are 5 pores, and on the suborbital about 6. The barbel may be as long as the snout itself. The posterior edge of the præoperculum is concave; the lower margin is thin, and very slightly crenelated if at all. The operculum is about half the length of the upper jaw, and about equal to the length of the snout. The interoperculum is scytheshaped; the pointed part extends behind the præoperculum, resembling a spine from the posterior corner of the latter. The opercular flap is free of the isthmus; the number of branchiostegal rays is 6.

The height of the body at the commencement of the first dorsal fin is from $^1/_6$ to $^1/_7$ of the total length. The distance between isthmus and anus, which gives the length of the actual body or alimentary cavity, is less than the head, and equal to the distance from midway between the point of the snout and the eye to the posterior edge of the gill cover. The distance of the first dorsal fin from the point of the snout is 4—5 times as long as the base of the fin, and its distance from the anterior margin of the orbital cavity is equal to the length of the head. It has 2 spines and 7—8 rays. The foremost spine is quite short, the second is strongly serrated; it is broken in nearly all specimens, and appears then about as long as the postorbital portion of the head; in the two smaller specimens, however, we can see that it terminates in a filiform extension, so that its full length would be about equal to the distance of the fin from the eye, or roughly $^2/_3$ the length of the head. The distance of the 2nd dorsal fin from the first is equal to the length of the upper jaw, and its proportion to the length of head 2.14—3.24. It commences above the 6th ray of the anal fin. Its rays are short, especially at the commencement. The anal fin commences just behind the anus, exactly under the last ray of the 1st dorsal fin. The pectoral fin has 18—19 rays, and is situate just behind the gill cover, in front of the first dorsal fin. Its length is equal to the postorbital portion of the head. The ventral fin has 8—9 rays. It is situate almost immediately under the pectoral; its first ray is very long, reaching to the 18th—22nd anal ray, and is slightly longer or a little shorter than the distance of the ventral fin from the point of snout. The body is covered with thin scales. There are about 145 scales in the lateral line, 7 series of scales between the 1st dorsal fin and the lateral line, 17 between the lateral line and the first anal ray; or, counting in oblique series; 7 scales between the 1st dorsal fin and the lateral line reckoning obliquely towards the rear, about 30 between the anus and the lateral line obliquely forward, and about 18 in an oblique series backwards. The cheeks, gill cover, and upper side of the head are also scaly; on the keels of the snout there are small spiny scales, rendering them rough to the touch. The scales are thin. The scales of the head are radially keeled; the keel being formed by close set spines, so small as to be visible only under the microscope. The body scales have parallel rows of slender spines similar to those in *Ch. murrayi,* GÜNTHER; only a few extremely bad scales have, however, been found. The number of keels or spine rows differs according to the part of the body from which the scales are taken; thus in the 48 cm. specimen, the scales on the frontalia midway between the eyes had two keels on either side of the median, whereas scales taken from between the pectoral and ventral fins had three on either side. It would also seem as if this feature differed with the age of the fish. In the 62 cm. specimen for instance, the interorbital scales had three keels on either side of the median, whereas those from the 48 cm. fish had, as already mentioned, only two here on either side. There are, however, too few well preserved scales on the fish to permit of more definite statements as to this. In the scales of the 48 cm. specimen, there were at least 4 growth zones, in the 62 cm. fish 5.

From this description, these fish are placed under *Chalinura simulus.* In some respects, they differ from the earlier description and illustration. GOODE and BEAN mention 9 rays in the first dorsal fin, besides the 2 spines, and 20 in the pectoral (No. 37, pag. 413). The snout appears more rounded than is the case with the "Michael Sars" specimens, and GOODE and BEAN write that the snout is not laterally bounded by keels (No. 37, pag. 412). Possibly, however, the lateral carinæ in the "Michael Sars" specimens may likewise have been less marked during life, so that the snout would here also have presented a rounded appearance. In GOODE and BEAN's figure, the scales of the gill cover are missing (No. 37, fig. 345). According to LÜTKEN, the diameter of the eye is only half the interorbital distance (No. 66, pag. 28). It may

(Arranged according to the length of head. With exception of the total length, the measurements are given in mm.).

| Total length, cm. | Length of head | Length of snout | Width of snout in the foremost part | Length of eye | Interorbital space | Postorb. length of head | Length of barbel | Height at the eye | Height of body at pectoral | Height of body at first dorsal | Distance between isthmus and anus | Distance between tip of snout and first dorsal | Base of first dorsal | Distance between first and second dorsal | Length of second spine in first dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26.5 ..... | 53 | 14.2 | 13 | 9.5 | 13.9 | 31 | 13 | 20 | 36 | 37.2 | 45 | 62 | 15 | 20 | 39 | 88 |
| 31 (reg.). Length of body 28 cm. Height of tail ½ cm..... | 72 | 19 | — | 14 | 18 | 42 | 17 | 33 | 53 | 54.2 | 63 | 82 | 18 | 25 | — | 53 |
| 39 ..... | 78 | 21 | — | 14 | 19 | 46 | 19 | 41 | 55 | 60 | 68 | 90 | 17 | 30 | — | „ |
| 38.5 (tip of tail broken) . | 81 | 22 | — | 14 | 18 | 48 | 19 | 39 | 55.5 | 61 | 65.5 | 92.5 | 19 | 25 | — | „ |
| 33.5 (reg.). Length of body 31 cm. Height of tail 1 cm. ..... | 86 | 23 | 20 | 16 | 20.5 | 55 | 20 | 40 | 63 | 67 | — | 99 | 24 | 35 | 56 | 88 |
| 47.5 ..... | 92 | 23 | — | 17 | 22 | 55 | 23 | 46 | 67.5 | 73 | 84 | 110 | — | 43 | — | 53 |
| 61.5 ..... | 121.5 | 30.5 | — | 20.5 | 28 | 73 | 34 | 62 | 97 | 104 | 107 | 141 | — | 52 | — | „ |

| Total length, cm. | Total length: Length of head | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Interorbital space: Horiz. diam. of eye | Postorbital part of head: Horiz. diam. of eye | Total length: Height of body at pectoral | Total length: Height of body at first dorsal | Height at first dorsal: Height at eye | Tip of snout to first dorsal: Base of first dorsal | Length of head: Distance between first and second dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26.5 ..... | 5.00 | 3.73 | 5.58 | 1.50 | 1.46 | 3.26 | 7.37 | 7.12 | 1.86 | 4.13 | 2.65 | 88 |
| 31 (reg.). Length of body 28 cm. Height of tail ½ cm..... | (4.31) | 3.79 | 5.14 | 1.36 | 1.29 | 3.00 | (5.85) | (5.72) | 1.64 | 4.56 | 2.88 | 53 |
| 39 ..... | 5.00 | 3.72 | 5.57 | 1.50 | 1.36 | 3.28 | 7.10 | 6.50 | 1.54 | 5.00 | 2.60 | „ |
| 38.5 (tip of tail broken).. | 4.76 | 3.77 | 6.24 | 1.65 | 1.38 | 3.69 | 6.82 | 6.32 | 1.57 | 4.87 | 3.24 | „ |
| 33.5 (reg.). Length of body 31 cm. Height of tail 1 cm. ..... | (3.96) | 3.74 | 5.37 | 1.44 | 1.28 | 3.44 | (5.40) | (5.07) | 1.67 | 4.12 | 2.46 | 88 |
| 47.5 ..... | 5.17 | 3.83 | 5.41 | 1.41 | 1.24 | 3.24 | 7.04 | 6.51 | 1.66 | — | 2.14 | 53 |
| 61.5 ..... | 5.06 | 3.99 | 5.93 | 1.49 | 1.37 | 3.56 | 6.35 | 5.91 | 1.68 | — | 2.34 | „ |

be added that the "Michael Sars" specimens resemble *Chalinura leptolepis* GÜNTHER, *mediterraneus* GIGLIOLI, and *serrulus* BEAN; also, though perhaps less markedly, *liocephalus* GÜNTHER and *fernandezianus* GÜNTHER.

The difference between *leptolepis* and *simulus* appears extremely small and uncertain. *Leptolepis* (No. 43, pag. 144, pl. XXXI) has a smaller barbel, equal only to the longitudinal diameter of the eye. The outermost ray of the ventral fin is also shorter, reaching to the 13th anal ray. The distance between anus and isthmus is slightly greater than in *simulus*, being equal to the length of the head.

*Mediterraneus* differs from the "Michael Sars" specimens in having 20 rays in the pectoral fin and 12 in

the ventral, as also by the fact that the first dorsal fin is situate directly above the pectoral (No. 29, pag. 345).

*Serrulus* has a slightly larger eye, this being $^1/_5$ the length of the head. The first dorsal fin has the same number of rays as GOODE and BEAN's *simulus*, viz. 9 (No. 3 a, pag. 37).

*Liocephalus* (No. 43, pag. 145, pl. XXXVIII, fig. A) has 11 rays in the 1st dorsal fin, 20 in the pectoral and 10 in the ventral. The pectoral fin is placed directly under the 1st dorsal. The scales at the side of the head have no keel, and there are no scales on the point of the snout.

*Fernandezianus* (No. 43, pag. 145, pl. XXXVIII, fig. B) has very slight breadth between the eyes, the interorbital distance being only $^3/_5$ the diameter of the eye. The præoperculum is distinctly crenelated. Interoperculum does not appear to end so sharply as in the *simulus* from the "Michael Sars". The distance from anus to isthmus is slightly less, being only equal to the distance from the posterior margin of the gill cover to the anterior edge of the eye, whereas in the "Michael Sars" specimens it corresponds to the distance between the posterior margin of the gill cover and a point between eye and point of snout. Furthermore, the snout, infraorbital, and præoperculum are almost entirely without scales, whereas scales were here found in the "Michael Sars" specimens.

The other species exhibit less resemblance; as a few of these were also taken on the "Michael Sars" expedition, we have now an opportunity of making comparison with these also.

Above will be found measurements and proportions of the *simulus* specimens from the "Michael Sars".

### ***Macrurus (Chalinura) murrayi,*** Günther.

1887. *Macrurus (Chalinurus) murrayi,* Günther (No. 43, pag. 146, pl. XXXIV, fig. A).
1895. *Chalinura murrayi,* (Günther), Goode & Bean (No. 37, pag. 412).

1 specimen, 39 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

5 specimens, 30—38 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

2 specimens, 28.5—29.5 cm., St. 101, 6-7/8, N. 57° 41′, W. 11° 48′, 1853 m.

$D_1$ II, 8—9, P. 19—22, V. 12—14, A. abt. 108, r. br. 6, (scales abt. $^7/_{17}$).

As will be seen, this macrurid differs from *Chalinura simulus* in the number of fin rays.

The head is contained 5—$5^3/_4$ times in the total length. In shape it is almost the same as that of *Chalinura simulus*; it is not cut off straight, however, in front, but extends in a point forward beyond the mouth. The length of snout and the interorbital distance are about equal, and greater than the eyes, so that the longitudinal diameter of the eye goes from 1.27 to 1.59 into the snout. The upper jaw terminates beneath the posterior margin of the eye. It has an outer series of open-set teeth, and on the inner side of these a villiform dentition. The lower jaw has a single series of teeth. The barbel is slightly larger than the interorbital distance. The interoperculum extends its pointed posterior portion behind the corner of the præoperculum as in *Chalinura simulus*. The number of branchiostegal rays is 6.

The height of the body goes from 5.6 to 7.2 times into the total length. The distance between isthmus and anus is less than the length of the head. The distance between point of snout and 1st dorsal fin is from barely 4 to roughly 5 times the base of the latter. This base is about as long as the interorbital distance. The 1st dorsal fin has one short and one long spine, and 8—9 rays; the long spine is highly serrated, and has a filiform prolongation, is length being thereby rendered about equal to the height of the body. The distance between the two dorsal fins corresponds more or less to the length of the postorbital part of the head and its proportion to the length of the head is 1.15—1.75. The 2nd dorsal fin begins above the 12th—18th anal ray. The anus lies slightly behind the end of the 1st dorsal fin, and immediately behind the anus the anal fin commences. This has about 108 rays. The pectoral fin has about 19—22 rays. It is situate in front of the 1st dorsal, just behind the gill opening, and its longest rays extend out beyond the anus. The ventral fin has 12—14 rays. Its position is immediately under the pectoral. Its extreme prolonged ray reaches to the 12—15th ray of the anal fin.

The scales had to a great extent fallen off, but there were marks of scales over the whole of the body except on the under side of the head. A series obliquely rearward between the 1st dorsal fin and the lateral line includes 7 scales; from the anus obliquely rearward to the lateral line 17. The scales are thin, with needleshaped spines on the free portion in parallel or slightly radial rows. The scales of the head are of the same character as those of the body, save that the spines stand out more obliquely, instead of being depressed as on the body scales. A fish of 36.5 cm. long from St. 95 had on the body scales 3 series of spines at either side of the median, in which latter there were 7 spines.

Pyloric appendages are present to the number of 9. In the stomach of the specimen from St. 25, crustaceans were found.

(Arranged according to the length of head. The total length in cm., the other measurements are given in mm.).

| Total length, cm. | Length of head | Tip of snout to eye | Width of snout anteriorly | Horizontal diam. of eye | Interorbital space | Postorbital length of head | Length of barbel | Height at the eye | Height of body at pectoral | Height of body at first dorsal | Distance between isthmus and anus | Tip of snout to first dorsal | Base of first dorsal | Distance between first and second dorsal | Length of second spine in first dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28.5 (entire) | 49 | 14 | 13 | 11 | 14 | 26.5 | 16 | 25 | 36 | 37 | 40 | 55 | 13 | 28 | abt. 42 | 101 |
| 29.5 Length of body 26.7. Height of tail 2 mm. | 56.5 | 17 | 16.7 | 10.7 | 16.2 | 34 | 19 | 27 | 47.5 | 50 | 50.5 | 68 | 15 | 39 | abt. 50 | 101 |
| 29 (broken) | 57 | 16 | — | 12 | 16 | — | abt. 16 | 28 | 47 | 52 | — | 69 | 13.5 | 43 | — | 95 |
| 33 (entire) | 60 | 16 | — | 12 | 18 | — | abt. 19 | 32 | 53 | 54 | — | 71 | 17 | 49 | — | 95 |
| 36.5 ( „ ) | 66 | 18.5 | — | 13.5 | 20 | — | 21 | 35 | 59 | 62 | — | 80 | 18 | 45 | — | 95 |
| 38 ( „ ) | 66 | 18 | — | 13 | 18 | — | 22 | 33 | 55 | 63 | — | 78 | 20 | 49 | — | 95 |
| 39 ( „ ) | 67.5 | 19 | — | 12.5 | 19 | — | 21 | 37 | 53 | 56 | 66 | 76.5 | 20 | 59 | 57 | 25 |
| 37 (broken) | 72 | 21 | — | 14 | 20 | — | abt. 26 | 37 | 59 | 62 | — | 87 | 17.5 | 60 | — | 95 |

| Total length, cm. | Total length: Length of head | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Interorbital space: Horiz. diam. of eye | Length of postorbital part of head: Horiz. diam. of eye | Total length: Height of body at pectoral | Total length: Height of body at first dorsal | Height at first dorsal: Height at eye | Tip of snout to first dorsal: Base of first dorsal | Length of head: Distance between first and second dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28.5 (entire) | 5.82 | 3.50 | 4.45 | 1.27 | 1.27 | 2.41 | 7.91 | 7.71 | 1.48 | 4.23 | 1.75 | 101 |
| 29.5 (broken). Length of body 26.7 cm. Height of tail 2 mm. | 5.22 | 3.32 | 5.28 | 1.59 | 1.51 | 3.18 | 6.21 | 5.90 | 1.85 | 4.53 | 1.45 | 101 |
| 29 (broken) | 5.10 | 3.56 | 4.75 | 1.33 | 1.33 | — | 6.17 | 5.57 | 1.86 | 5.11 | 1.33 | 95 |
| 33 (entire) | 5.50 | 3.75 | 5.00 | 1.33 | 1.50 | — | 6.23 | 6.10 | 1.69 | 4.17 | 1.22 | 95 |
| 36.5 ( „ ) | 5.54 | 3.57 | 4.88 | 1.37 | 1.48 | — | 5.54 | 5.89 | 1.77 | 4.44 | 1.47 | 95 |
| 38 ( „ ) | 5.76 | 3.67 | 5.07 | 1.39 | 1.39 | — | 5.76 | 6.03 | 1.91 | 3.90 | 1.35 | 95 |
| 39 ( „ ) | 5.78 | 3.55 | 5.40 | 1.52 | 1.52 | — | 7.36 | 6.96 | 1.51 | 3.81 | 1.15 | 25 |
| 37 (broken) | 5.14 | 3.43 | 5.14 | 1.50 | 1.43 | — | 6.27 | 5.96 | 1.68 | 4.97 | 1.20 | 95 |

Of the *Chalinura* species, *Ch. mediterraneus,* GIGLIOLI has the same number of rays in the ventral fin as *Ch. murrayi,* viz. 12. GIGLIOLI, however, asserts that they are two distinct species (No. 29, pag. 343—45, No. 37, pag. 533, fig. 345 A). According to GIGLIOLI's description of the two specimens also, there appear to be several points of difference. In the first place it would seem that the scales of *mediterraneus* are not spiny, but merely keeled, in addition to which, there are some differences in the proportions of the body. The proportion of the height of the body to the total length is in *mediterraneus* $5^1/_2$, in *murrayi* 6—7. The proportion of the head to the total length is in *mediterraneus* $4^2/_3$, and in *murrayi* 5 to $5^3/_4$. But the total length is not a reliable standard of measurement in the *Macruridæ*, and greater weight should therefore be attached to differences in the position of the fins. In *mediterraneus,* the 1st dorsal fin is placed above the pectoral, the 2nd dorsal commences above the 6th anal ray,

and the ventral fin, which is situate in front of the pectoral, extends as far as the 20th anal ray. In *murrayi* the 1st dorsal fin is set behind the pectoral, the 2nd dorsal commences above the 12—18th anal ray, and the ventral fin is situate under the pectoral, its prolonged ray reaching only to the 12—15th anal ray.

***Macrurus (Chalinura) brevibarbis,*** Goode & Bean.
Pl. V, fig. 10.

1895. *Chalinura brevibarbis,* Goode & Bean (No. 37, pag. 413).

1 specimen, 25 cm., St. 10, 19/4, N. 45° 26′, W. 9° 20′, 4700 m., yellow mud.

3 specimens, 26—33 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

1 specimen, about 34 cm., St. 101, 6-7/8, N. 57° 41′, W. 11° 48′, 1853 m., hard clay.

$D_1$ II 8, P. 19—20, V. 8—10.

*Macrurus (Chalinura) brevibarbis* resembles in appearance *Ch. murrayi,* but differs from this by the number of rays in the ventral fin. It is distinguished from *Chalinura simulus* by the facts that the barbel is shorter than the eye, the distance between the ventral fin and the anus equal to or less than half the length of the head, and by the long ray of the ventral fin, which reaches only to the 6th anal ray. From both the mentioned species also, as well as from all other species of *Chalinura* hitherto described, *brevibarbis* differs in having the scales of the head furnished with rows or keels of spines, these standing straight up, and set close together, like the teeth of a comb.

The head goes about $4^1/_2$—$5^3/_4$ times into the total length; this cannot be accurately determined when the tail is broken. The snout projects in front of the mouth. Its anterior breadth is almost equal to its length, and only slightly less than the interorbital distance. Its length goes from about 3 to $3^3/_4$ times into the length of the head. The eye goes from $5^3/_5$ to $6^1/_2$ times into the head, about $1^3/_4$ times into the snout, and from $1^3/_4$ to $2^1/_4$ times into the interorbital distance. The eye, by the way, is as long as the distance from point of snout to mouth. The cleft of the mouth reaches back to just underneath the posterior margin of the eye. There are small villiform teeth in the upper jaw, placed inside a series of strong teeth. In the lower jaw there is only one series, save at the front, by the symphysis where there are 2. The barbel is, as the name indicates, but small, being from less than half to over $^2/_3$ the length of the eye. The inferior margin of the præoperculum is crenelated, and behind its corner the posterior point of the interoperculum projects like a spine. The opercular flap is free of the isthmus; there are six branchiostegal rays.

The profile rises fairly high from the head to the first dorsal fin, as in *murrayi,* the proportion between the height at the eye and at the commencement of the 1st dorsal fin being 1.62—1.83. The greatest height of body is to the length of the head as 1 : 1.15—1 : 1.53, and is equal to or slightly greater than the part of the head behind the snout. The distance between isthmus and anus is greater than the height of body, but less than the length of the head, being equal to the distance between the posterior margin of the gill cover to the lateral corner of the snout, or at any rate to a point in front of the eye. The distance between the ventral fin and the anus is slightly less than half the length of the head, corresponding to the distance from point of snout to posterior margin of the eye.

The distance from the first dorsal fin to point of snout is from barely 4 to $4^1/_3$ times the base of the fin. Its distance from the anterior margin of the eye is equal to the length of the head, as is also the case in *simulus* and *murrayi.* It has 2 spines, and 8 branched rays. The first spine is as usual very short, the second has sharp teeth pointing rearwards, and is longer than the distance

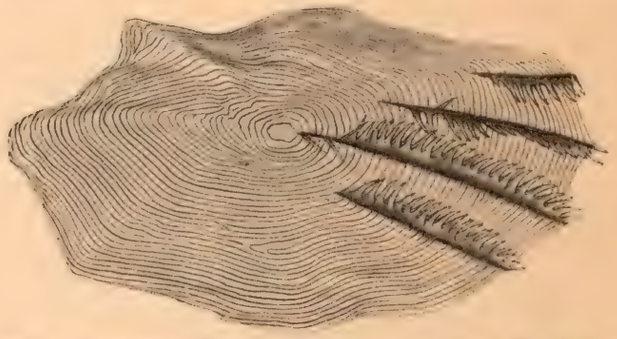


Fig. 36. *Macrurus (Chalinura) brevibarbis,* G. &. B., 33.5 cm. Scale behind the eye (× 14.5).

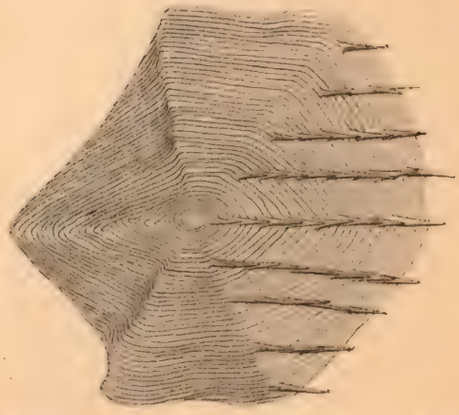


Fig. 37. *Macrurus (Chalinura) brevibarbis,* G. & B., 33.5 cm. Scale between $D_2$ and lat. line (× 14.5).

(The total length in cm. The other measurements in mm.).

| Total length cm. | Length of head | Tip of snout to eye | Width of snout in the foremost part | Length of eye | Interorbital space | Postorb. length of head | Length of barbel | Height at the eye | Height of body at pectoral | Height of body at first dorsal | Distance between isthmus and anus | Ventral to anus | Tip of snout to first dorsal | Base of first dorsal | Length of second spine in first dorsal | Distance between first and second dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| abt. 25 ... ..... | 52 | 14 | 12 | 8 | 16 | — | 3 | 22.5 | — | 36.5 | — | 20 | — | — | — | 11 | 10 |
| abt. 26 (tip of tail is lost) | 55 | 15.5 | 17 | 9 | 19 | — | 6.5 | 26 | — | 46 | 50 | — | 67 | 17 | — | 15.7 | 88 |
| 32 (perfect) ..... | 56 | 18 | 17 | 10 | 22 | — | 5 | 26.2 | — | 46 | 52 | — | 67 | 16 | — | 20.5 | 88 |
| abt. 33 (tip of tail is lost) | 66 | 19 | 19 | 11.5 | 23 | — | 6.2 | 29.5 | — | 54 | 60 | 31 | — | — | — | — | 88 |
| 33.5 (tip of tail broken) .. | 75 | 22 | 21 | 13.2 | 24 | 44.5 | 9 | 37 | 64 | 65 | 70 | 35 | 87 | 20 | 48 | 32 | 101 |

(Arranged according to the length of head).

| Total length cm. | Total length: Length of head | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Tip of snout to eye: Horiz. diam. of eye | Interorbital space: Horiz. diam. of eye | Postorb. length of head: Horiz. diam. of eye | Horiz. diam. of eye: Length of barbel | Total length: Height of body at pectoral | Total length: Height of body at first dorsal | Length of head: Height of body at first dorsal | Height at first dorsal: Height at eye | Tip of snout to first dorsal: Base of first dorsal | Length of head: Distance between first and second dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| abt. 25 ..... | (4.81) | 3.71 | 6.50 | 1.75 | 2.00 | — | 2.66 | — | (6.85) | 1.43 | 1.62 | — | 4.73 | 10 |
| abt. 26 (tip of tail is lost)..... | (4.73) | 3.55 | 6.11 | 1.72 | 2.11 | — | 1.38 | — | (5.65) | 1.20 | 1.77 | 3.94 | 3.51 | 88 |
| 32 (perfect) ..... | 5.72 | 3.12 | 5.60 | 1.80 | 2.20 | — | 2.00 | — | 6.96 | 1.22 | 1.76 | 4.19 | 2.74 | 88 |
| abt. 33 (tip of tail is lost)..... | (5.00) | 3.48 | 5.74 | 1.65 | 2.00 | — | 1.86 | — | (6.11) | 1.22 | 1.83 | — | — | 88 |
| 33.5 (tip of tail broken) ..... | (4.47) | 3.41 | 5.68 | 1.67 | 1.28 | 3.37 | 1.47 | (5.23) | (5.16) | 1.15 | 1.76 | 4.35 | 2.34 | 101 |

between the two dorsal fins, but less than the height of the body. The distance between the two dorsal fins is slightly greater or sligthly less than the interorbital distance, whereas GOODE and BEAN state it as being only half the interorbital distance (No. 37, pag. 413). The second dorsal fin commences almost above the 5—8th anal ray. The anus is close behind the vertical of the first dorsal fin's termination, and the anal fin commences immediately behind the anus. The pectoral fin has 19—20 rays. It is situate in front of the first dorsal, and is about as long as the postorbital portion of the head. Slightly in front of the vertical line through the commencement of the pectoral fin is the ventral fin. The specimen from St. 101 had 9 rays in the right ventral fin, 8 in the left. The others have 10. The outermost ray is prolonged, and reaches to the 3rd—6th anal ray.

GOODE and BEAN's specimens and those from St. 10 and 88 had lost their scale covering almost entirely. GOODE and BEAN mention (No. 37, pag. 413) that the few scales remaining had about 6 longitudinal series of small spines. The scales found on the specimens from St. 88 are so badly preserved that the spines had also disappeared, save in the scales of the head; fortunately, however, the specimen from St. 101 had a portion of the scale covering in good preservation. In the head, both snout and præoperculum, as well as the lower part of the infraorbital, had been scaly. Between the first dorsal fin and the lateral line there appear to have been 6 or 7 rows.

The head scales have radial series of spines in varying numbers according to the part from which taken. The median row has about 30 spines, the lateral about 20.

The spines are set, as already mentioned, close to one another, and stand straight out from the surface of the scale, with the point curving slightly over towards the rear (fig. 36).

The scales of the body are exactly like those in *Ch. murrayi*. They have awlpointed spines, comparatively long, and somewhat depressed. The posterior spines extend out over the margin of the scale. The spines are set in 3—4 parallel rows on either side of the median and there are up to 7 spines in the middle rows (fig. 37).

The specimen from St. 88, which measured 32 cm., had 10 *appendices pyloricæ*. The same specimen had remains of crustacea in the stomach, sponge needles, foraminifera, and other bottom forms.

***Macrurus carapinus,*** Goode & Bean.

1883. *Coryphænoides carapinus*, Goode & Bean, (No. 35, pag. 197).
1887. „ „ (Goode & Bean), Günther (No. 43, pag. 138).
1895. „ „ Goode & Bean, (No. 37, pag. 404, fig. 339).
1898. „ „ (Goode & Bean), Jordan & Evermann (No. 56 III, pag. 2579).

1 specimen, 34 cm., St. 35, 18-19/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

6 specimens, 12.5—24.5 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615—2865 m., hard clayish mud.

1 specimen, 28 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

$D_1$ II 8, P. 15—19, V. 9—10.

These fish agree in point of proportions with GOODE and BEAN's description of *Coryphænoides carapinus* to such a degree that they are placed under this species, despite the fact that all the scales had fallen off, rendering it impossible to support the determination by comparison in this respect. In one point they differ from GOODE and BEAN's figure (No. 37, pl. XCVII, fig. 339); the position of the ventral fin is in front of the first dorsal, not under its commencement. They should not, however, be ascribed to the sub-genus *Coryphænoides* (GÜNTHER, No. 43, pag. 124), as the mouth is situate on the under side of the head, which is also shown to be the case by GOODE and BEAN's figure and text (No. 37, pag. 404). The sub-genus must be *Chalinura*, as the teeth in the outer row of the upper jaw are largest, although this is not very pronounced.

They also strongly resemble *Lionorus filicauda*, GÜNTHER (No. 43, pag. 141, pl. XXXIV, fig. B), differing, however, from this chiefly by the fact that the eye and barbel are larger.

The length of head in proportion to the height of body is about the same as in GOODE and BEAN's *carapinus* (No. 37, fig. 339), the height of body in the 4 largest going about $1^1/_6$ to $1^1/_3$ times into the length of head; in the four small ones and in *filicauda* the head is slightly longer in proportion, the height of body here going $1^2/_5$ times into length of head. The snout is about $^1/_3$ of the head; a keel runs from its point, which is rough, to midway between the eyes, and another from the lateral corner in a curve over the nostrils to the eyes; the same thing is found in *carapinus* and *filicauda*. The proportion of the eye to the head is, according to the illustrations: *carapinus* 4.57 — in GOODE and BEAN's text we read that the eye is contained 4 times in the head — *filicauda* 5.42; specimens from the "Michael Sars" 4.21—5.16. In *filicauda*, the eye goes about twice into the length of snout, whereas in *carapinus* and the four largest of our fish it goes only about $1^1/_2$ times into this. The mouth, as in *filicauda*, runs to the posterior margin of the eye; it appears, however, to be slightly smaller in GOODE and BEAN's *carapinus*, reaching only to the posterior margin of the pupil. As a matter of fact, however, the upper jaw in the "Michael Sars" specimens does not reach farther than this, and is here, exactly as stated by GOODE and BEAN, equal to half that part of the head behind the snout. In the upper jaw there is an outer series of more or less powerful teeth, and inside these, several rows of smaller teeth, with only a single row farthest back. In the lower jaw, near the symphysis, they are irregularly grouped, otherwise uniserial or biserial; judging from the teeth therefore, they should be placed under *Chalinura*. The dental arrangement is, however, not essentially different from either *carapinus* or *filicauda*; GOODE and BEAN state, as regards *carapinus*: "The teeth are in villiform bands in intermaxillary and mandible; the mandibulary series uniserial in about the second half of its length" (No. 37, pag. 405), while GÜNTHER, for *filicauda*, gives the following:—"upper teeth villiform in a very narrow band, those of the mandible very small, biserial" (No. 43, pag. 141). The barbel is, as in *carapinus*, about $^2/_3$ the length of the eye, while in *filicauda* it is just visible. The length of the postorbital portion of the head, both in *carapinus* and *filicauda*, as well as our fish, is about equal to half the entire head. The præoperculum is, as in the two mentioned species, greatly extended in its posterior portion, which is rounded and crenelated.

The foremost spine in the first dorsal fin is insignificant, the second has a filiform prolongation, but is shorter than the head; as in *carapinus*, it is armed with backward curving spines, whereas in *filicauda*, according to GÜNTHER, this dentition is only slightly marked, and may at times be lacking altogether.

| Total length | Length of head, mm. | Tip of snout to eye | Tip of snout to mouth | Length of eye | Height of eye | Interorbital space | Length of barbel | Length of postorbital part of head | Height of body at first dorsal | Isthmus to anus | Base of first dorsal | Distance between first and second dorsal | Length of second spine in first dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.5 cm. (entire) | 31 | 10 | 6 | 6 | 5 | 10 | 4 | 15 | 22 | 23 | 6.5 | — | — | 53 |
| 21 „ (broken) | 42 | 14 | 8.1 | 8.5 | 7.2 | 14 | 5.5 | 20.5 | 33.5 | 28 | 11 | 30 | — | 53 |
| 24.5 „ (reg.). Body 22.2 cm. Height of tail 2 mm. | 45 | 15 | 9.5 | 10 | 8 | 16 | 7 | 22.8 | 34 | 38.5 | 11 | 19 | — | 53 |
| 28 „ (reg.) | 54.2 | 18 | 11 | 11 | 9 | 19.5 | 7 | 27 | 46 | 46 | 14.2 | 23.5 | 31 | 88 |
| 34 „ (entire) | 59 | 20 | 10 | 14 | 12 | 20 | 8 | 28 | 51 | 49 | 15 | 44 | abt. 41 | 35 |

| Total length | Length of head: Height of body | Length of head: Tip of snout to eye | Length of head: Length of eye | Tip of snout to eye: Length of eye | Length of eye: Height of eye | Length of head: Postorbital part of head | Station |
|---|---|---|---|---|---|---|---|
| 17.5 cm. (entire) | 1.41 | 3.10 | 5.16 | 1.67 | 1.20 | 2.06 | 53 |
| 21 „ (broken) | 1.25 | 3.00 | 4.94 | 1.65 | 1.18 | 2.04 | 53 |
| 24.5 „ (reg.) | 1.32 | 3.00 | 4.50 | 1.50 | 1.25 | 1.97 | 53 |
| 28 „ (reg.) | 1.18 | 3.01 | 4.92 | 1.64 | 1.22 | 2.02 | 88 |
| 34 „ (entire) | 1.16 | 2.95 | 4.21 | 1.43 | 1.17 | 2.11 | 35 |

The second dorsal fin commences above the 10-16th anal ray. GOODE and BEAN say 10-12th for *carapinus*, their figure shows it as over the 5th, whereas in *filicauda*, it commences at the same distance from the snout as the anal fin. Consequently, the anus is in this species close in front of the vertical from the 2nd dorsal fin, whereas in GOODE and BEAN's and the "Michael Sars" *carapinus*, it is nearer the first dorsal. The pectoral fin is placed slightly in front of the ventral, and reaches to the 3rd-5th anal ray. The ventral fin is again slightly in front of or directly under the first dorsal, whereas in GOODE and BEAN's figure of *carapinus*, the ventral fin is placed slightly behind the first dorsal, as also in *filicauda*. The prolonged ray of the ventral fin reaches to the 3rd-10th anal ray; according to GOODE and BEAN's figure to the 9th, but in *filicauda* only as far as the 2nd. The proportion, however, between the prolonged ray and the other rays of the ventral fin appears to have been the same as in *carapinus*.

***Macrurus carapinus,*** Goode & Bean (?).

1 specimen 9.5 cm. (tip of tail broken), St. 88, 18/7, N. 45° 26′ W. 25° 45′, 3120 m., sand and yellow mud.

$D_1$ II 8, P. 22, V. 10, l.tr. abt. 22.

This small *Macrurus* has the appearance as *Macrurus carapinus*, GOODE and BEAN, but the position of the ventrals in relation to the pectorals brings some doubt if it belongs to this species.

The ventrals are namely situated before the pectorals below the hindmost part of the gill cover and therefore somewhat before the first dorsal. At the eight specimens even described and at the figure of *M. carapinus* from GOODE and BEAN (No. 37, fig. 339) on the other hand the ventrals are placed behind the pectorals just before the first dorsal or under the foremost part of it.

Moreover the pectoral has 22 rays, while the number of rays in the other specimens has a variation between 15 and 19 rays.

The pectorals and the ventrals reach about the 12th anal ray; the origin of the second dorsal is about over the 8th anal ray. The position of the anus is under the last ray in the first dorsal.

The scales have the hexagonal form ordinary in the *Macruridæ*. They have an awlshaped spine, which reaches from the innermost concentrical ring to a little outside the margin of the scale.

Otherwise the description will be a recapitulation of what is said of *Macrurus carapinus*.

Total length 9.5 cm. (tip of tail broken).

Height of body 16 mm., proportion to total length about 1 : 5.93; proportion to length of head 1 : 1.33.

Height of head at the eye 11 mm., proportion to height of body 1 : 1.45.

Length of head 21.2 mm., proportion to total length about 1 : 4.47.

Snout to eye 6 mm., proportion to length of head 1 : 3.54.

Snout to mouth 4.5 mm., proportion to snout to eye 1 : 1.33.

Breadth of snout 6.2 mm.

Horiz. diam of eye 4.5 mm., proportion to length of head 1 : 4.72; proportion to snout to eye 1 : 1.33; proportion to interorbital space 1 : 1.78.

Interorbital space 8 mm.

Length of postorbital part of head 11.7 mm., proportion to length of head 1 : 1.82.

Length of barbel abt. 2.8 mm., proportion to length of eye abt. 1 : 1.43.

From lateral corner of snout to hindmargin of gill cover 19.2 mm.

Snout to first dorsal 23 mm.

From anterior margin of eye to first dorsal 18.5 mm.

Base of first dorsal 5.5 mm., proportion to snout to dorsal 1 : 4.18.

Length of second spine in first dorsal abt. 13 mm., proportion to length of head 1 : 1.63.

Distance between first and second dorsal 6.8 mm.

Isthmus to anus 14.5 mm.

Ventral to anus 7 mm., proportion to length of head 1 : 3.03.

Length of pectoral 11 mm.

***Macrurus (Malacocephalus) lævis,*** Lowe.

1887. *Macrurus (Malacocephalus) lævis,* (Lowe), Günther (No. 43, pag. 148, pl. XXXIX, fig. B).
1911. *Macrurus lævis,* (Lowe), Zugmayer (No. 92, pag. 127).

9 specimens, 2 of them measured 45—51 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

As stated by GÜNTHER in characterising *Malacocephalus* (No. 43, pag. 124) these have biserial teeth in the upper jaw, and uniserial in the lower, and the longest ray of the 1st dorsal fin is smooth. The first dorsal has moreover one short and one long simple ray or spine, and eleven articulated rays. The pectoral fin has 18, the ventral 9 rays. In the stomach of the specimen measuring 45 cm. were found 1 *Chlorotocus* sp., 10 cm. long, some Schizopoda of 5 cm., a number of Isopoda and Copepoda.

***Macrurus (Nematonurus) armatus,*** Hector.

1875. *Macrurus armatus,* Hector (No. 46 a, pag. 81).
1887. „ *(Nematonurus) armatus,* (Hector), Günther (No. 43, pag. 150, pl. XL, fig. A.).
1888. *Coryphænoides gigas,* Vaillant (No. 86, pag. 232, pl. XX, fig. 2).
1916. *Nematonurus gigas,* (Vaillant), Roule (No. 79 b, pag. 21).
1919. „ „ „ „ (No. 79 c, pag. 87, pl. III, figs. 1 & 1 a.).

1 specimen, 70 cm., St. 10, 19/4, N. 45° 26′, W. 9° 20′, 4700 m., yellow mud.

1 specimen, 66 cm., St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

8 specimens, 39—74 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615—2865 m., yellow hard clayish mud.

7 specimens, 41—54 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

These fish agree in all essentials both with GÜNTHER's description and illustration of *Nematonurus armatus,* HECTOR, and with VAILLANT's particulars as to *Coryphaenoides gigas*. The greatest point of difference from this latter is that the dorsal spines is serrated, whereas in VAILLANT's specimen it was smooth or only slightly serrated at the extreme portion. VAILLANT says (No. 86, pag. 233):—

"Cette épine ne peut pas être regardée comme réellement denticulée, bien qu' à la terminaison il soit possible de reconnaître trois ou quatre rugosités ascendantes, peu élevées; sur le reste de son étendue on ne trouve que des inégalités moins sensibles à la vue qu' au toucher".

In the drawing, the spine is shown as perfectly smooth (No. 86, pl. XX, fig. 2). If it really is smooth, then *gigas* should, according to GÜNTHER's divison (No. 43, pag. 124), be reckoned as belonging to *Malacocephalus*. If not, then the specimens from the "Travailleur" and "Talisman" and those from the "Michael Sars" — all from the Atlantic — must be of the same species and identical with the "Challenger"'s *Nematonurus armatus* from the Pacific and from the North Atlantic.

A description of the "Michael Sars" specimens is here given in proof.

$D_1$ 10—11, P. 18—21, V. 9—10.

| Total length | Height of body at first dorsal | Tip of snout to first dorsal | Tip of snout to anus | Isthmus to anus | Length of head | Tip of snout to eye | Horiz. diam. of eye | Interorbital space | Length of barbel | The long spine in first dorsal | Base of first dorsal | Distance between first and second dorsal | Length of second ray in anal | Length of the rays midway in the anal | Tip of snout to pectoral |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| abt. 385 mm..... | 65 | 89 | abt. 133 | 92 | 73 | 19 | 16 | 19 | — | — | 24 | 54 | — | — | 78 |
| „ 410 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 438 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 452 „ (tip of tail reg.) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 460 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 520 „ ..... | 87 | 117 | 183 | 130 | 95 | 25 | 18 | 25 | 16 | 69 | 32 | 70 | 27 | 33 | 101 |
| „ 530 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 535 „ ..... .... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 567 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 580 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 580 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 635 „ ..... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| „ 640 „ (tip of tail reg.) | — | — | 230 | — | 115 | 29 | 24 | 28 | — | — | 36.2 | 76 | — | — | — |
| 66 cm. (reg.)..... | 112 | 160 | 230 | 156 | 121 | 37 | 24 | 32 | 19 | 86 | 43 | 82 | 28 | 37 | 132 |
| 70 cm..... | 145 | 165 | 280 | 198 | 140 | 35 | 24 | 40 | 25 | 84 | 45 | 77 | 34 | 34 | 142 |
| 73 cm..... | abt. 150 | 178 | 275 | 198 | 146 | 37 | 27 | 39 | 22 | 91 | 44 | 85 | 30 | 43 | 152 |
| 74 cm..... | 133 | 174 | 275 | 199 | 138 | 36 | 27 | 35 | 21 | 76 | 45 | 90 | 33 | 44 | 146 |

Height of the body at commencement of first dorsal fin is $^1/_5$—$^1/_6$ of total length, distance between foremost dorsal fin and point of snout a little more than $^1/_4$ of total length, and the anus is situate somewhat in rear of the first third of the body, the distance between anus and point of snout going about $2^1/_2$ times into the total length. The length of the head is not much different from the height of the body. It is less than the distance between isthmus and anus, but about half the distance from anus to snout. This is $^1/_4$ the length of the head, or slightly more. The eye is not particularly large; it goes from $4^1/_2$ to $5^1/_3$ times into the length of the head, and the distance from centre of pupil to point of snout is equal to about $^1/_3$ of the length of the head. The interorbital distance is greater, being about equal to the length of the snout. The nostrils are separated by a membrane, the breadth of which is equal to the diameter of the foremost nostril. The foremost nostril itself is circular, the hinder one crescent-shaped with the concave side in front. The mouth is situate entirely on the underside of the head; the cleft of the mouth extends to the posterior edge of the eye. Upper and lower jaw have each but one series of teeth. The lower lip has 5-6 cavities with pores. The barbel is fairly strong, but generally shorter than the diameter of the eye. The number of branchiostegal rays is 6.

The first dorsal fin has 10-11 rays, the foremost being a short, thick spine. The second is the longest, and may be twice as long as the base of the fin. It is serrated throughout its whole length; most markedly so, however, on the distal portion.

The second dorsal has quite short rays anteriorly. It commences at a distance from the anterior dorsal $1^3/_4$ to $2^1/_4$ times the length of the latter's base. The anal fin commences slightly farther forward than the second dorsal; the rays are fairly long throughout.

The pectoral fin has 18-20 rays. It is situate immediately behind the gill opening, and thus in front of the first dorsal, but its longest ray reaches beyond this. The

| Length of pectoral | The longest ray in ventral | Number of rays in first dorsal | Number of rays in pectoral | Number of rays in ventral | Number of scales in a series obliquely rearwards between first dorsal and lateral line | Number of scales in a series obliquely rearwards between second dorsal and lateral line | Number of scales in a series obliquely forewards between anus and lateral line | Number of scales in lateral line | Station | |
|---|---|---|---|---|---|---|---|---|---|---|
| — | 49 | 10*) | 18 | 9 | 7 | 10 | — | between 140 and 150 | 53 | *) A short spine before the long serrated one is not found. |
| — | — | — | — | — | 7 | 9 | — | — | 88 | |
| — | — | — | — | — | 6 | 8 | abt. 25 | — | 88 | |
| — | — | — | — | — | 8 | 9 | „ 26 | — | 88 | Tip of tail regenerated. |
| — | — | — | — | — | 8 | 9 | „ 25 | — | 88 | |
| 63 | 70 | 11 | 19 | 10 | 7 | 9 | „ 23 | tip of tail reg. abt. 145 | 88 | Tip of tail regenerated. |
| — | — | — | — | — | 8 | 11 | „ 30 | — | 88 | |
| — | — | — | — | — | 7 | 10 | „ 30 | — | 88 | |
| — | — | — | — | — | 8 | 10 | „ 33 | — | 53 | |
| — | — | — | — | — | 8 | 10 | „ 32 | — | 53 | The outermost tip of tail is lost. |
| — | — | — | — | — | 7 | 10 | „ 30 | — | 53 | |
| — | — | — | — | — | 8 | 11 | „ 34 | — | 53 | Regenerated. |
| — | — | 10 | — | — | 7 | 10 | „ 28 | abt. 140 | 53 | Impossible to count the scales in lat. line. |
| 80 | 79 | 11 | 19 | 10 | 7 | 10 | 32 | abt. 140 lat. line reg. | 35 | Regenerated. |
| 81 | 97 | 10 | 20 | 9 | 7 | 10 | 32 | abt. 125 tail reg. | 10 | Tail regenerated. |
| 93 | 98 | 11 | 20 | 10 | 7 | 10 | 30 | 140—150 | 53 | The outermost tip of tail is lost. |
| 87 | 87 | 11 | dext. 20 sinist. 21 | 10 | 8 | 11 | 34 | over 140 | 53 | |

ventral fins have 9-10 rays. The extreme ray is more than twice the length of the next one.

The fish is covered with scales throughout, save for the opercular membrane and the under side of the head; here also, however, the part between the mandible and the hyoid arch is covered with scales. Possibly a greater portion of the lower side of the head has been scaly, and the scales may have been scraped off in the trawl. This theory is supported by GÜNTHER's statement (No. 43, pag. 150) to the effect that the lower portion of the præoperculum lacks scales, but that scales are found here in well-preserved specimens.

The lateral line has between 140 and 150 scales. On counting the scales straight over the back in front of the first dorsal fin from the lateral line to the lateral line again, we find 17-21; counting ventrally on the level of the first dorsal fin there are 52-80. A more accurate method is to count in the oblique series. A series obliquely rearwards between the first dorsal fin and the lateral line includes 6-8 scales, besides a small one close up to the fin; this has, however, as a rule, fallen away. Between the commencement of the second dorsal fin and the lateral line, a row taken obliquely towards the rear numbers 8-11 scales. From the anus in a row obliquely forward to the lateral line there are 23-24.

The scales are hexagonal (fig. 38). The front portion of the scale, which is embedded in the skin, curves inwards toward the rear on either side. The free rhombic field has more or less parallel series of spines; the median row is no stronger than the others. Outside each row of spines there is a small tooth or projection in the edge of the scale. The number of series of spines depends on the size of the fish. Growth zones may be distinguished by breaks in the striation of the scales. At St. 53, the specimen measuring 39 cm. had 2-3 series of spines on either side of the median, and 4 growth zones at least can be distinguished. The specimen of 74 cm. had 6-7 rows of spines on either side of the median, and at least 8 growth zones.

| Total length | Total length: Height of body just before first dorsal | Total length: Tip of snout to first dorsal | Total length: Tip of snout to anus | Total length: Length of head | Length of head: Tip of snout to eye | Length of head: Horiz. diam. of eye | Length of head: Interorbital space | Distance between first and second dorsal: Base of first dorsal | Station |
|---|---|---|---|---|---|---|---|---|---|
| 385 mm. | 5.93 | 4.32 | 2.89 | 5.27 | 3.85 | 4.56 | 3.85 | 2.24 | 53 |
| abt. 520 „ | 5.97 | 4.45 | 2.84 | 5.48 | 3.80 | 5.30 | 3.80 | 2.19 | 88 |
| abt. 640 „ | — | — | 2.78 | 5.57 | 3.97 | 4.79 | 4.10 | 2.10 | 53 |
| 66 cm. | 5.89 | 4.12 | 2.87 | 5.45 | 3.27 | 5.05 | 3.78 | 1.90 | 35 |
| 70 „ | 4.83 | 4.24 | 2.50 | 5.0 | 4.0 | 5.83 | 3.50 | 1.71 | 10 |
| 73 „ | 4.90 | 4.10 | 2.65 | 5.0 | 3.90 | 5.40 | 3.70 | 1.93 | 53 |
| 74 „ | 5.54 | 4.24 | 2.68 | 5.34 | 3.84 | 5.10 | 3.94 | 2.0 | 53 |

| Total length | Height of body just before first dorsal in % of total length | Length of head in % of total length | Tip of snout to eye in % of length of head | Horiz. diam. of eye in % of length of head | Interorbital space in % of length of head | Station |
|---|---|---|---|---|---|---|
| abt. 385 mm. | 16.8 | 19.0 | 26.0 | 21.9 | 26.0 | 53 |
| abt. 520 „ | 16.7 | 18.3 | 26.3 | 18.9 | 26.3 | 88 |
| abt. 640 „ | — | 18.0 | 25.2 | 20.8 | 24.4 | 53 |
| 66 cm. | 17.0 | 18.3 | 30.6 | 19.8 | 26.4 | 35 |
| 70 „ | 20.7 | 20.0 | 25.0 | 17.1 | 28.6 | 10 |
| 73 „ | 20.5 | 20.0 | 25.4 | 18.5 | 26.7 | 53 |
| 74 „ | 18.5 | 18.7 | 26.1 | 19.6 | 25.4 | 53 |

A comparison of this description with GÜNTHER's and VAILLANT's does not reveal any great points of difference.

GÜNTHER gives 11 rays in the first dorsal fin, VAILLANT 10; in the "Michael Sars" specimen there are 10—11. VAILLANT writes that the distance between the two dorsal fins is $2^1/_2$ times as great as the base of the first dorsal itself (No. 86, pag. 233). According to his drawing, this proportion is 2.36, whereas in our specimens, it varies from 1.71 to 2.25. On the other hand, the pectoral fin in the "Michael Sars" specimens extends beyond the first dorsal, whereas in VAILLANT's it does not reach the hinder edge of this.

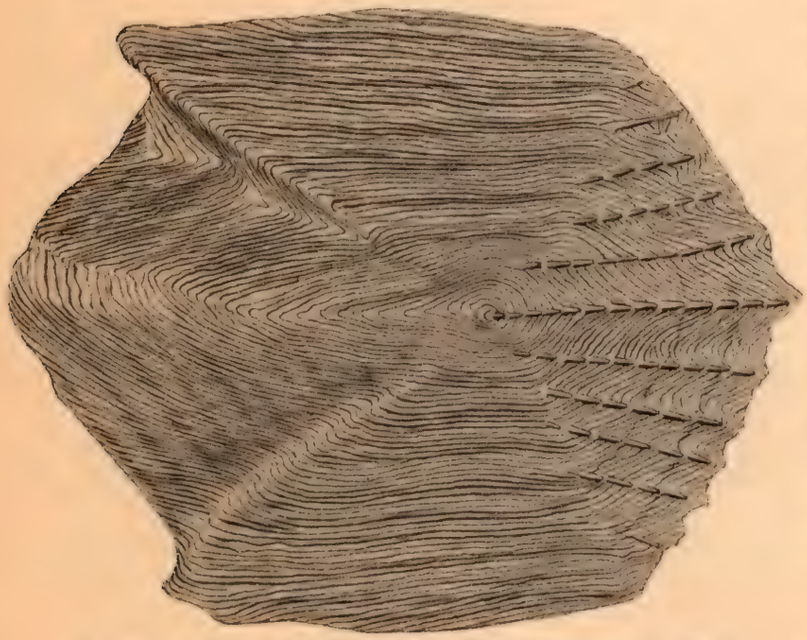


Fig. 38. *Macrurus (Nematonurus) armatus*, Hector, abt. 52 cm. Scale from the third series below lateral line at the level of commencement of $D_1$ (× 10).

GÜNTHER mentions 8 series of scales between the first dorsal fin and the lateral line. VAILLANT gives 9 here, and 34 between the lateral line and the median ventral line. In the "Michael Sars" specimens, 17—21 scales were found from lateral line to lateral line measured dorsally, and 52—80 taken ventrally, the averages being 19 and 66 respectively. The half of these values corresponds very well with GÜNTHER's and VAILLANT's statements. In the "Michael Sars" specimens there are 140—150 scales in the lateral line; VAILLANT gives 138. The caudal scales on the lateral line are, however, difficult to count; in the first place they were often found to have fallen off, leaving the skin and scale pockets damaged, in addition to which the extreme point of the tail was frequently found to have been lost and replaced by regeneration.

The greatest point of difference is, as already mentioned, the dentition of the long dorsal spine; this may, however, possibly be of minor importance, as in well preserved specimens the lower portion of this serrated spine is covered with skin to such an extent that the dentition is rather to be felt than seen.

### ***Bathygadus melanobranchus,*** Vaillant.

| | | |
|---|---|---|
| 1888. | *Bathygadus melanobranchus,* | Vaillant (No. 86, pag. 206, pl. XVIII, fig. 1). |
| 1895. | „ „ | (Vaillant), Goode & Bean (No. 37, pag. 424). |
| 1896. | „ „ | (Vaillant), Collett (No. 13, pag. 88). |
| 1906. | „ „ | (Vaillant), Brauer (No. 8, pag. 272). |

2 specimens, abt. 38—42 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

16 specimens, abt. 24—42 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

| Total length | Height of body | Length of head | Horizont. diam. of eye | Vertical diam. of eye | Length of snout | Interorbital space | Postorbital part of head | Snout to first dorsal | Snout to anus | Ventral to anus | First dorsal to second dorsal | Rays in first dorsal | Pectoral fin rays | Ventral fin rays | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23.6 cm. (outermost tip of tail broken) | 35 | 43 | 10.5 | 7.5 | 14 | 16 | 22 | 46 | 64 | 25 | — | 10 | — | 9 | 41 |
| 19 „ (broken) | 30 | 44 | 11 | 9 | 12 | 15 | 21 | 46 | 60 | — | — | 11 | — | 8 | 41 |
| 26 „ (tail broken) | 40 | 58 | 15 | 12 | 16 | 16 | 28 | 61 | 85 | 31 | — | 11 | 16 | 8 | 41 |
| 27.5 „ (tip of tail broken) | 42 | 59 | 15 | 13 | 16 | 18 | 29.5 | 64 | 88 | 33 | — | 12 | — | 8 | 41 |
| 25.5 „ (tail broken) | 45 | 61 | 17 | 13 | 18 | 18 | 30 | 66 | 91 | — | — | 11 | 16 | 8 | 41 |
| 26.5 „ (tail broken) | 47 | 64 | 19.5 | 16 | 18 | 19 | 30.5 | 70 | 93 | 33 | 2.5 | 12 | 17 | 8 | 41 |
| 27.5 „ (tail broken) | — | 66 | 19 | — | 18 | — | 33 | — | — | — | — | — | — | — | 41 |
| 32.3 „ (tip of tail broken) | — | 68 | 19.5 | — | 18.5 | — | 32.5 | — | — | — | — | — | — | 8 | 41 |
| 31 „ (tail broken) | — | 72 | 20.5 | — | 20 | — | 34 | — | — | — | — | — | — | 8 | 41 |
| 35.2 „ (tip of tail broken) | 53 | 72 | 20.5 | 18 | 20 | 21 | 35 | 77.5 | 110 | 41 | 4 | 12 | 16 | 8 | 41 |
| 34 „ (tip of tail broken) | 55 | 73 | 20 | 17 | 22 | 21 | 36 | 82 | 119 | 41 | 6 | 12 | — | 8 | 41 |
| 28 „ (tail broken) | — | 74 | 21 | — | 21.5 | — | 39 | — | — | — | — | — | — | 8 | 41 |
| 35 „ (tip of tail broken) | 52 | 74 | 19 | 17 | 19 | 21 | 37 | 77 | 110 | 44 | 4 | 11 | — | 8 | 41 |
| 35 „ (tail broken) | 55 | 79 | 19 | 18.2 | 24 | 21 | 41 | 81 | 123 | 39 | 5 | 12 | abt. 16 | 8 | 41 |
| 38 „ (tip of tail broken) | 56 | 80 | 23 | 18 | 20.5 | 22 | 41 | 84 | 122 | 46 | 3 | 11 | 17 | 8 | 23 |
| 41.6 „ (outermost tip of tail broken, regenerated) | 66 | 81 | 23 | 20.5 | 24 | 22 | 41 | 92 | 132 | 47 | 5 | 11 | abt. 15 | 8 | 23 |
| 41 „ (tip of tail broken) | 70 | 95 | 24 | 21 | 27 | 24 | 50 | 98 | 147 | 50 | — | 12 | — | dext. sin. 9 8 | 41 |

| Total length | Total length: Height of body | Total length: Length of head | Length of head; Length of eye | Length of head: Length of snout | Length of snout: Length of eye | Length of head: Interorbital space | Interorbital space: Length of eye | Postorbital part of head: Length of eye | Total length: Tip of snout to dorsal | Total length: Tip of snout to anus | Length of head: Ventral to anus | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23.6 cm. (outermost tip of tail broken) | 6.75 | 5.49 | 4.09 | 3.07 | 1.33 | 2.68 | 1.52 | 2.10 | 5.13 | 3.69 | 1.72 | 41 |
| 19 „ (broken) | 6.34 | 4.32 | 4.00 | 3.67 | 1.09 | 2.94 | 1.36 | 1.91 | 4.13 | 3.17 | — | 41 |
| 26 „ (tail broken) | 6.50 | 4.48 | 3.86 | 3.62 | 1.07 | 3.62 | 1.07 | 1.87 | 4.26 | 3.06 | 1.87 | 41 |
| 27.5 „ (tip of tail broken) | 6.55 | 4.66 | 3.94 | 3.69 | 1.07 | 3.28 | 1.29 | 1.97 | 4.30 | 3.13 | 1.79 | 41 |
| 25.5 „ (tail broken) | 5.67 | 4.18 | 3.59 | 3.39 | 1.06 | 3.39 | 1.06 | 1.77 | 3.86 | 2.80 | 1.77 | 41 |
| 26.5 „ (tail broken) | 5.64 | 4.14 | 3.28 | 3.56 | 0.92 | 3.37 | 0.98 | 1.57 | 3.79 | 2.85 | 1.94 | 41 |
| 27.5 „ (tail broken) | — | 4.17 | 3.47 | 3.66 | 0.95 | — | — | 1.74 | — | — | — | 41 |
| 32.3 „ (tip of tail broken) | — | 4.75 | 3.49 | 3.68 | 0.95 | — | — | 1.67 | — | — | — | 41 |
| 31 „ (tail broken) | — | 4.31 | 3.51 | 3.60 | 0.98 | — | — | 1.66 | — | — | — | 41 |
| 35.2 „ (tip of tail broken) | 6.65 | 4.89 | 3.51 | 3.60 | 0.98 | 3.43 | 1.02 | 1.71 | 4.54 | 3.20 | 1.76 | 41 |
| 34 „ (tip of tail broken) | 6.18 | 4.66 | 3.65 | 3.32 | 1.10 | 3.48 | 1.05 | 1.80 | 4.14 | 2.86 | 1.78 | 41 |
| 28 „ (tail broken) | — | 3.79 | 3.52 | 3.44 | 1.02 | — | — | — | — | — | 1.86 | 41 |
| 35 „ (tip of tail broken) | 6.74 | 4.73 | 3.90 | 3.90 | 1.00 | 3.52 | 1.11 | 1.95 | 4.55 | 3.18 | 1.68 | 41 |
| 35 „ (tail broken) | 6.37 | 4.44 | 4.16 | 3.29 | 1.26 | 3.76 | 1.11 | 2.16 | 4.32 | 2.84 | 2.02 | 41 |
| 38 „ (tip of tail broken) | 6.79 | 4.75 | 3.48 | 3.90 | 0.89 | 3.64 | 0.96 | 1.78 | 4.52 | 3.12 | 1.74 | 23 |
| 41.6 „ (outermost tip of tail brok., regen.) | 6.30 | 5.14 | 3.52 | 3.38 | 1.04 | 3.68 | 0.96 | 1.78 | 4.52 | 3.15 | 1.72 | 23 |
| 41 „ (tip of tail broken) | 5.86 | 4.31 | 3.96 | 3.52 | 1.22 | 3.96 | 1.00 | 2.08 | 4.18 | 2.79 | 1.90 | 41 |

***Bathygadus sp. (favosus,*** Goode and Bean?).

1895. *Bathygadus favosus,* Goode & Bean (No. 37, pag. 420, fig. 352).

1 specimen, abt. 32 cm., St. 24, 6-7/5 N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

This *Bathygadus* is distinguished from *B. melanobranchus* chiefly by the small size of the eye, and by the fact that the ventral fin has up to 10 rays. In the proportions between head, snout, eye and interorbital space it agrees with GÜNTHER's description of *B. cottoides* (No. 43, pag. 154, pl. XLII, fig. A). The number of scale rows between the first dorsal fin and the lateral line also agrees mostly with *cottoides;* apparently there have been five rows, *cottoides* has presumably 6. In the number of fin rays and of branchiostegal rays, as also in the position of the fins themselves, it resembles more GOODE and BEAN's *favosus.* There is, however, in comparison with this species, some discrepancy in the proportion between the various parts of the head, and as regards the scales, GOODE and BEAN give 10 rows above the lateral line (No. 37, pag. 420).

The tip of the tail is broken off, wherefore the proportions as regards total length can only be approximate. The height of body goes 7 times into total length, and the head abt. $4^2/_3$ times into the same. Eye abt. $^1/_6$ length of head, snout and interorbital space $^1/_3$, the length of eye being thus half that of the snout and of the interorbital space. Postorbital part of head $3^1/_4$ times length of eye. Oral aperture terminates nearly under posterior margin of eye. Jaws set with teeth in a villiform band, those in the upper jaw much broader than in the mandible.

Distance from point of snout to first dorsal fin a trifle more than length of head. First dorsal has 12 rays, the second of which appears to have been serrated; its base is a little more than the breadth of the snout. The second dorsal begins immediately behind the first, and the anal under the eight ray of the second dorsal. Under the third ray of the first dorsal are the pectoral fins, each with 17 rays, and slightly in front, immediately under the origin of the first dorsal fin, are the ventrals. Of these, the right has 10, the left 9 rays; their longest ray would apparently almost have reached to the anal fin. The anus is situate at the termination of the first third of the body, and its distance from the base of the ventral fins is about half the length of the head.

This specimen is in very bad condition, and not suited for closer description.

| | | |
|---|---|---|
| Total length | | 31.5 cm. |
| (tip of tail lost, regenerated). | | |
| Height of body | abt. | 45 mm. |
| Length of head | | 68 „ |
| Horizont. diam. of eye | | 11 „ |
| Vertical diam. of eye | | 9.5 „ |
| Length of snout | abt. | 21.5 mm. |
| Interorb. space | | 22.5 „ |
| Postorb. part of head | abt. | 35.5 „ |
| Snout to first dorsal | | 69 „ |
| Snout to anus | | 95 „ |
| Ventral to anus | | 32 „ |
| Rays in first dorsal | | 12 |
| Pectoral fin rays | | 17 |
| Ventral fin rays | | dext. 10, sin. 9 |
| Radii branchiostegi | | 8 |

| | |
|---|---|
| Total length: Height of body | 7.00 |
| Total length: Length of head | 4.63 |
| Length of head: Horiz. diam. of eye | 6.18 |
| Length of head: Length of snout | 3.16 |
| Length of snout: Horiz. diam. of eye | 1.95 |
| Length of head: Interorb. space | 3.02 |
| Interorb. space: Horiz. diam. of eye | 2.04 |
| Postorb. part of head: Horiz. diam. of eye | 3.23 |
| Total length: Snout to dorsal | 4.56 |
| Total length: Snout to anus | 3.32 |
| Length of head: Ventral to anus | 2.12 |

***Bathygadus arcuatus,*** Goode and Bean.

Pl. VI, fig. 6.

1895. *Bathygadus arcuatus,* Goode and Bean (No. 37, pag. 421).

1 specimen, abt. 33 cm., tip of tail broken, but regenerated, St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

1 specimen, abt. 35 cm., tip of tail broken, St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

As will be seen from the following, these fishes answers well to GOODE and BEAN's description.

Height of body abt. $5^1/_2$ times in total length.

The profile slopes somewhat steeply down from the high neck in a concave curve to the snout, which is cut off straight in front (fig. 39). Head $^1/_5$ total length, long.

Fig. 39. *Bathygadus arcuatus,* G. & B., abt. 35 cm.

diameter of eye about $^1/_4$ head, vertical diameter $^1/_5$. Snout $3^1/_2$ to $3^3/_4$ times in length of head, its breath a little over twice the length of the eye. Interorbital space

| Total length cm. (In both specimens the tip of tail is broken) | Height of body | Length of head | Horizont. diam. of eye | Vertical diam. of eye | Length of snout | Breadth of snout | Interorbital space | Length of barbel | Postorbital part of head | Tip of snout to first dorsal fin | Length of second ray in first dorsal | Base of first dorsal | Distance between first and second dorsal | Tip of snout to ventral | Tip of snout to anus | Ventral to anus | Length of second ray in pectoral | Length of first ray in ventral | Length of second ray in ventral | Rays in first dorsal | Pectoral fin rays | Ventral fin rays |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 60 | 67 | 17 | 13.7 | 18 | — | 11 | 48 | 35.5 | 82 | 122 | 22 | 3 | — | 123 | 50 | 149 | 73 | — | 12 | 18 | 8 |
| 35 | 63 | 71 | 17 | 14 | 20.5 | 32 | 13 | 55 | 37.5 | 88 | abt. 54 | 24 | 6 | 75 | 117 | 48 | 63 | 102 | 87 | 12 | 21 | 9 |

| Total length cm. (In both specimens the tip of tail is broken) | Total length: Height of body | Total length: Length of head | Length of head: Horiz. diam. of eye | Length of head: Vertical diam. of eye | Length of head: Length of snout | Length of snout: Horiz. diam. of eye | Length of head: Interorbital space | Interorbital space: Horiz. diam. of eye | Total length: Length of barbel | Length of head: Length of barbel | Length of barbel: Horiz. diam. of eye | Postorbital part of head: Horiz. diam. of eye | Total length: Tip of snout to first dorsal | Tip of snout to first dorsal: Base of first dorsal | Total length: Tip of snout to anus | Length of head: Ventral to anus | Second ray of pectoral: Length of head |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 5.50 | 4.93 | 3.94 | 4.89 | 3.72 | 1.06 | 6.09 | 0.65 | 6.89 | 1.40 | 2.82 | 2.09 | 4.02 | 3.73 | 2.68 | 1.34 | 2.22 |
| 35 | 5.56 | 4.93 | 4.17 | 5.06 | 3.46 | 1.21 | 5.46 | 0.77 | 6.36 | 1.29 | 3.24 | 2.20 | 3.98 | 3.67 | 2.99 | 1.48 | 0.89 |

5½ to 6 times in length of head, and ⅔ to ¾ in the horizontal diameter of the eye, or slightly less than its vertical do.

The mouth extends back behind the eye. Dental armature of the jaws forms a close pile of insignificantly small teeth. Lower jaw entirely embraced by the upper. The barbel is very strongly developed, about 6⅛ to 6⁹/₁₀ times in total length, 1⅛ in length of head, and is 3¼ times the length of eye. Postorbital part of head 2 to 2¼ times the length of the eye.

Distance of first dorsal fin from point of snout four times in total length, and is 3⅔ to 3¾ times its basis. It has 12 rays, the second of which is equal in length to the barbel in the one specimen, but the extreme portion is here broken off, in the other, it is nearly twice as long as the head. Distance between the two dorsal fins about ⅛ to ⅙ the length of the eye. Height of second dorsal at its middle equal about to length of snout. The anal fin commences below the eighth ray of the second dorsal, and is much lower. Anus at commencement of second third of the body. The pectoral fin is situate above the ventral, both slightly anterior to the first dorsal.

The pectoral fins have 18-21 rays, the second ray prolonged, its length equal to height of body in the one specimen, but is here somewhat damaged; in the other it is 2¼ times the length of head. The ventrals have 9 rays, first and second prolonged, the first reaching to the 18th anal ray, the second is cleft, but its outer branch prolonged, reaching to the 12th anal ray; in the other specimen the first ray does not reach beyond the 7th anal ray and is only a little longer than the head; the prolonged portion of the second ray is broken off.

The lateral line runs from the neck above the branchial aperture at a distance of abt. ⅓ the height of body from the back, straight down to below the commencement of second dorsal fin; here it turns obliquely down, makes another curve at the level of the pectoral fin, and continues then out on to the tail slightly below the middle of the body.

There are seven rows of scales between the first dorsal and the lateral line. The scales themselves resemble those in *Bathygadus longifilis*, GOODE and BEAN, described and figured by VAILLANT (No. 86, pl. XXIII, fig. 1 c). The colour was bluish-black on lower jaw, operculum, the belly and on the fins.

***Bathygadus longifilis,*** Goode and Bean.

1887. *Bathygadus longifilis,* (Goode & Bean), Günther (No. 43, pag. 157).
1888. *Hymenocephalus longifilis,* (Goode & Bean), Vaillant (No. 86, pag. 218, pl. XXIII, fig. 1).
1895. *Bathygadus longifilis,* Goode & Bean (No. 37, pag. 422).
1896. „ „ (Goode & Bean), Collett (No. 13, pag. 90).
1906. „ „ (Goode & Bean), Brauer (No. 8, pag. 270, pl. XII, fig. 7).
1913. „ „ (Goode & Bean), Weber (No. 90, pag. 173).

2 specimens, abt. 9—22 cm., St. 23, 6/5, N. 35° 32′, W, 7° 7′, 1215 m., yellow mud.

11 specimens, abt. 18—25 cm., St. 24, 6-7/5, N. 35° 34′, W. 7° 35′, 1615 m., yellow mud.

2 specimens, abt. 15 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

| Total length cm. | Height of body | Length of head | Horizont. diam. of eye | Vertical diam. of eye | Length of snout | Breadth of snout | Interorbital space | Length of barbel | Postorbital part of head | Tip of snout to first dorsal | Length of second ray in first dorsal | Base of first dorsal | Snout to ventral | Snout to anus | Ventral to anus | Origin of anal | Length of second ray in pectoral | Length of first ray in ventral | First ray of ventral reaches to | Rays in first dorsal | Pectoral fin rays | Ventral fin rays | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22.3 ..... | 26 | 35.5 | 9 | 8 | 9.5 | 13 | 8.5 | 15 | 18 | 38 | abt. 69 | 13 | 38.5 | 56 | 20 | under 9th ray of sec. dors. | at least 59 | abt. 65 | 26th anal ray | 12 | abt. 18 | 9 | 23 |
| 24 (tip of tail lost, regen.) | 30 | 43.5 | 10 | 9 | 12 | — | 10 | abt. 17 | 21.5 | 46 | — | — | — | 70 | 19.5 | — | at least 87 | abt. 76 | 30th anal ray | 10 | 17 | 8 | 24 |

| Total length cm. | Total length: Height of body | Total length: Length of head | Length of head: Horiz. diam. of eye | Length of head: Vert. diam. of eye | Length of head: Length of snout | Length of snout: Horiz. diam. of eye | Length of head: Interorbital space | Interorbital space: Horiz. diam. of eye | Total length: Length of barbel | Length of head: Length of barbel | Length of barbel: Horiz. diam. of eye | Postorbital part of head: Horiz. diam. of eye | Total length: Tip of snout to first dorsal | Tip of snout to first dorsal: Base of first dorsal | Total length: Tip of snout to anus | Length of head: Ventral to anus | Second ray in pectoral: Length of head | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22.3 | 8.60 | 6.29 | 3.94 | 4.44 | 3.74 | 1.05 | 4.18 | 1.06 | 14.9 | 2.36 | 1.67 | 2.00 | 5.87 | 2.92 | 3.98 | 1.77 | 1.66 | 23 |
| 24 | 8.0 | 5.52 | 4.35 | 4.84 | 3.63 | 1.20 | 4.35 | 1.00 | 14.1 | 2.56 | 1.70 | 2.15 | 5.22 | — | 3.43 | 2.23 | 2.00 | 24 |

## *Gadidæ.*

The genera arranged according to similarity in the structure of the scales.

***Gadus callarias,*** Lin.

21 specimens, 49—109 cm., St. 72, 1/7, N. 44° 35′, W. 51° 15′, 75 m.

4 specimens, 100—108 cm., St. 99, 6/8, N. 57° 45′, W. 13° 40′, 149 m.

The four specimens from St. 99 were taken on lines at the Rockall Bank. The 21 from St. 72 were received from a French fisherman on the Newfoundland Bank.

Most of those from Newfoundland were spawning or spent. A quantity of cod eggs and small young cod were also found in the water here. The spawning of cod on the Newfoundland Bank thus takes place far later in the year than on the coast of western Europe, where it occurs in the first 3-4 months of the year.

The following table shows the length, sex, and degree of maturity, II indicating that the genital products are but slightly developed, VI that the fish is spawning, and VII that it is spent. The age is also noted, as indicated by the growth rings of the scales.

| | | | | |
|---|---|---|---|---|
| 49 | cm. | ♂ | II. | 5 years |
| 55 | „ | „ | II. | 4 „ |
| 59 | „ | „ | VI. | 6 „ |
| 61 | „ | „ | IV. | 5 „ |
| 63 | „ | „ | VI. | 6 „ |
| 65 | „ | ♀ | II. | 7 „ |
| 66 | „ | „ | II. | 7 „ |
| 73 | „ | ♂ | VII. | 6 „ |
| 74 | „ | ♀ | VII. | 6 „ |
| 75 | „ | ♂ | VII. | 7 „ |
| 78 | „ | „ | VII. | 7 „ |
| 83 | cm. | ♂ | VI-VII. | 8 years |
| 84 | „ | „ | V. | 10 „ |
| 84 | „ | „ | VI. | 8 „ |
| 84 | „ | ♀ | VII. | 8 „ |
| 87 | „ | ♂ | VII. | 7 „ |
| 89 | „ | „ | VII. | 9 „ |
| 93 | „ | „ | VII. | 8 „ |
| 101 | „ | „ | VII. | 11 „ |
| 102 | „ | „ | VII. | 8 „ |
| 109 | „ | ♀ | VII. | 11 „ |

### *Gadus æglefinus,* Lin.

1 specimen, 20.5 cm. St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

This haddock is only distinguished from others by the fact that the foremost rays in the first dorsal fin are very long, especially the second, which is prolonged in a filament. The second ray is always the longest, but is as a rule only slightly longer than the third. SMITT in 'Skandinaviens fiskar' (No. 82, I, pag. 469), states it as being $15^1/_2$—$18^1/_2$ % of the length of the body. JORDAN and EVERMANN, in 'The Fishes of north and middle America', (No. 56, III, pag. 2543) give it as $^3/_4$ the length of the head, and DAY, in 'The Fishes of Great Britain and Ireland' (No. 19, I, pag. 283) writes that it is slightly longer than the base of the first dorsal fin.

In this specimen, however, the second dorsal ray is 5.4 cm., the third 4.5 cm. and the fourth 3.9 cm. As the length of the body is 18.1 cm., that of the head 5.3 cm., and the base of the dorsal fin 2.2 cm., this means that the second dorsal ray is 29.8 % the length of the body, about equal to the length of the head, and more than twice as long as the base of the first dorsal fin. Otherwise, the fish bears the usual specific characteristics of the haddock as will be seen from the description below.

$D_1$ 14, $D_2$ 23, $D_3$ 19. $A_1$ 22, $A_2$ 21.

Base of $D_1$ 2.2 cm.

Base of $D_2$ 4.2 cm. Proportion to base of $D_1$ 1.9, according to GÜNTHER 2 (No 41, IV, pag. 333).

Base of $D_3$ 2.9 cm. Proportion to base of $D_1$ 1.3, according to GÜNTHER 1.1—1.5.

Base of $A_1$ 4.3 cm. Proportion to base of $D_1$ 1.9, according to GÜNTHER 1.8—1.9.

Base of $A_2$ 3.2 cm. Proportion to base of $D_1$ 1.4, according to GÜNTHER 1.2—1.5.

Between $A_1$ and $A_2$ there is a slight interval.

The caudal fin is forked.

Length of the body 18.1 cm., greatest height 4.1 cm. According to GÜNTHER's 'Catalogue of the fishes in the British Museum' the height of the body should be less than or equal to the length of the head (No. 41, IV, pag. 332). Thus the length of the head is to the total length as 1 : 3.9, GÜNTHER states it as 1 : 3.8. The snout projects forward over the mandible, the barbel is short. The anus is situate just beneath the commencement of the second dorsal fin. In the pigmentation we find the black lateral line characteristic of the haddock and the black spot between the pectoral fin and the first dorsal.

### *Gadus merlangus,* Lin.

8 specimens, 21—40 cm., St. 14, 22/4, N. 41° 15′, W. 8° 54′, 69 m.

1 specimen 21 cm. ♂
2 „ 22 „ „
1 „ 23 „ „
1 „ 25 „ „
1 „ 26 „ „
1 „ 27 „ „
1 „ 40 „ ♀ mature, contents of stomach: *Caranx.*

### *Gadus luscus,* Lin.

36 specimens, 14—27 cm., St. 14, 22/4, N. 41° 15′, W. 8° 54′, 69 m.

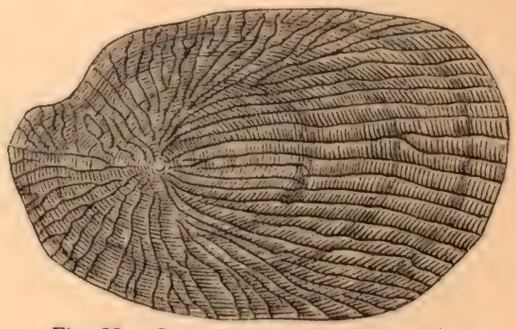


Fig. 39. *Gadus luscus,* Lin., 25 cm. ♂ Scale (× 18).

Measurements and determination of sex as follows:

| Number | Length cm. | ♂ | ♀ | Maturity according to same scale as noted for cod. |
|---|---|---|---|---|
| 1 | 14 | 1 | | |
| 1 | 15 | 1 | | |
| 3 | 16 | 2 | 1 | |
| 7 | 17 | 5 | 2 | |
| 9 | 18 | 2 | 7 | III, IV and V. |
| 2 | 19 | 2 | | |
| 1 | 20 | | 1 | VI. |
| 3 | 21 | 2 | 1 | III. |
| 3 | 22 | 3 | | V. |
| 2 | 23 | 2 | | VII. |
| 3 | 25 | 2 | 1 | III. |
| 1 | 27 | 1 | | |
| Total 36 | | 23 | 13 | |

***Gadus esmarkii,*** Nilss.

2 specimens, 15 and 20 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

***Gadus poutassou,*** Risso.

2 specimens, 28 and 30 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

8 specimens, 14—26 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

***Gadiculus thori,*** Schmidt.

1913. *Gadiculus thori,* Schmidt (No. 80, pag. 7).

40 specimens, 6—10 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

1 specimen, 3.2 cm., St. 96, 27/7, N. 50° 57′, W. 10° 46′, 184 m.

***Gadiculus argenteus,*** Guichenot.

14 specimens, the largest 15 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m.

***Molva elongata,*** Risso.

1862. *Molva elongata,* (Risso), Günther (No. 41, IV, pag. 362).

1 specimen, 52 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

The first dorsal fin has 12 rays.

The ventral fins extend farther back than the pectorals. The concentric rings of the scales are of equal thickness throughout, and thus do not present the appearance of rows of beads, as is the case with *Molva byrkelange.*

Fig. 41. *Molva elongata,* Risso. 52 cm. Scale (× 29).

***Onos reinhardti,*** Kr.

5 specimens, 16.5—21 cm., St. 102, 9-10/8, N. 60° 57′, W. 4° 38′, 1098 m., dark sand and clay.

Fig. 42. *Onos reinhardti,* Kr. 21 cm. Scale (× 25).

***Merluccius vulgaris,*** Flem.

20 specimens, 15—30 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m.

5 specimens, 38—78 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m.

22 specimens, 22—33 cm., St. 14, 22/4, N. 41° 15′, W. 8° 54′, 69 m.

52 specimens, 16—70 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m.

8 specimens, 26—72 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m.

5 specimens, 14—19 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

10 specimens, 36—62 cm., St. 39 b, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m.

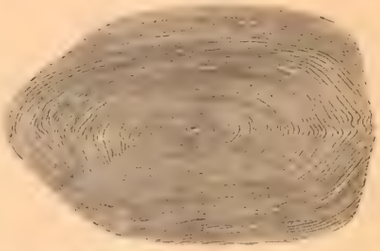


Fig. 43. *Merluccius vulgaris,* Flem. 68 cm. ♀ Scale (× 5).

***Antimora rostrata,*** Günther.

1878. *Haloporphyrus rostratus,* Günther (No. 42, pag. 18).
1878. „ *viola,* Goode & Bean (No. 34, pag. 257).
1885 (87). *Antimora viola* (Goode & Bean), Jordan (No. 54, pag. 917 [129]).
1887. *Antimora rostrata,* Günther (No. 43, pag. 93, pl. XVI, fig. A).
1887. „ *viola* (Goode & Bean), Günther (No. 43, pag. 94, pl. XV).
1896. „ „ (Goode & Bean), Collett (No. 13, pag. 59).
1898. „ „ (Goode & Bean), Lütken (No. 66, pag. 30).
1911. „ *rostrata* (Günther), Zugmayer (No. 92, pag. 122).

1 specimen, 330 mm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m.

14 specimens, 245—262 mm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

16 specimens, 265—450 mm., St. 101, 6-7/8, N. 57° 41′, W. 11° 48′, 1853 m.

In July 1878, GÜNTHER published a preliminary description (No. 42, pag. 18) of *Haloporphyrus rostratus,* which he considered, however, ought to be distinguished from *Haloporphyrus* under the name of *Antimora,* since the snout projected out in front of the mouth, the anus was situate far back, and the anal fin deeply indented, almost bifurcate.

GOODE and BEAN knew only this brief mention by GÜNTHER, and when, in November 1878, they issued a

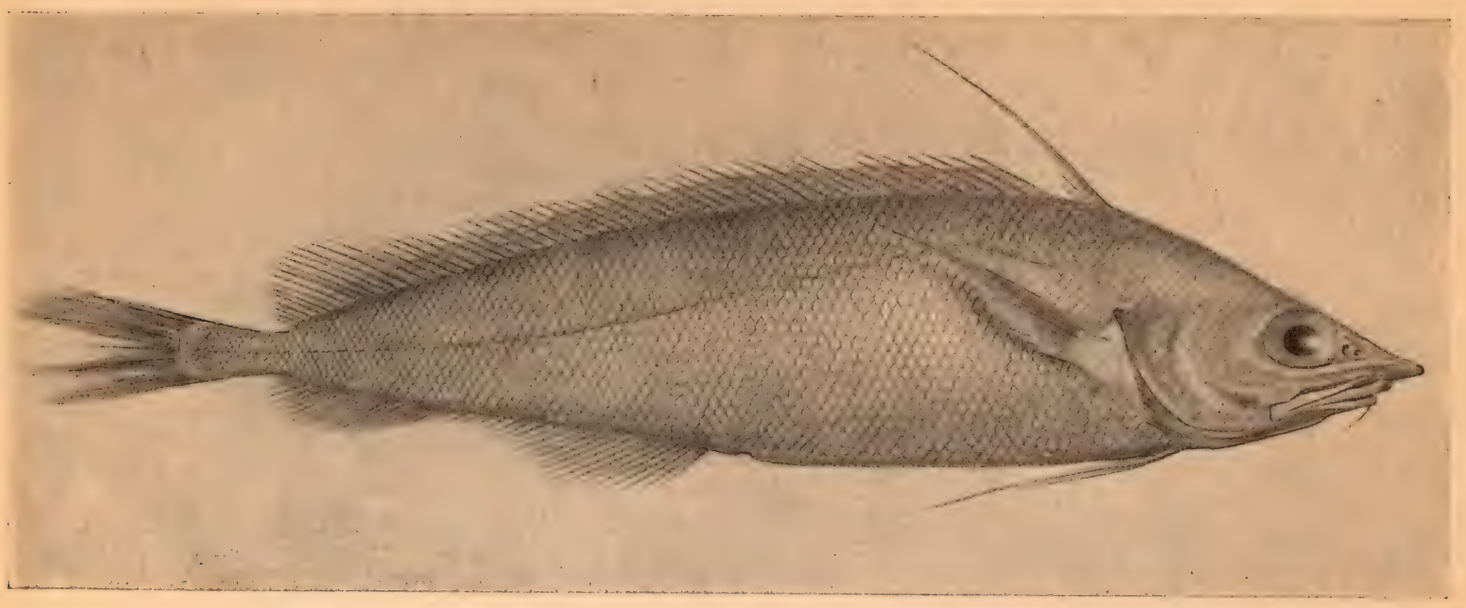


Fig. 44. *Antimora rostrata*, Günth., 36 cm., St. 101.

description (No. 34, pag. 257) of two specimens taken in August of the same year by Captain COLLINS on Le Have Bank at 4—500 fathoms depth, they set it up as a new species, *Haloporphyrus viola.*

GÜNTHER maintained, in the CHALLENGER report, GOODE and BEAN's *viola* species as closely related to *rostrata,* under the generic term *Antimora*, subject, however, to the proviso that the specific characters should prove constant. After 2 *rostrata* from the CHALLENGER, and 1 *viola* from the U. S. Fish Commission, he notes as the most important distinguishing features in the shape of the body between *rostrata* and *viola* the following:

The length of the head is, in the case of *rostrata,* equal to half the distance between the ventral and anal fins (No. 43, pag. 93), whereas in *viola* it is longer (No. 43, pag. 94). The eye in *rostrata* is round, in *viola* oval, and its horizontal diameter is shorter than the snout in *rostrata* but of the same length as this in *viola.*

It will, however, be seen from the following, that these conditions vary in such a manner that the two species merge into one another, and should be taken as one, which will then be that first named by GÜNTHER as *Antimora rostrata.*

When the two species were first introduced, however, the authors ascribed the different specimens to that species with which they were best found to agree, albeit, as LÜTKEN says, there is doubt as to whether it really is a question of two species (No. 66, pag. 30).

COLLETT's *viola* from the Prince of Monaco's cruises with the "*Hirondelle*" (No. 13 b, pag. 59) exhibits the same relation between the length of the head and the distance from ventral fins to anus as GÜNTHER's *viola;* the longitudinal diameter of the eyes, however, is less than the snout, so that in this respect it appears nearer both to GÜNTHER's *rostrata* and to ZUGMAYER's, to which we shall now refer.

ZUGMAYER's *rostrata* from the Prince of Monaco's cruises with the "Princesse Alice" (No. 92, pag. 122) has its snout longer than the horizontal diameter of the eye, like GÜNTHER's *rostrata.* In the proportion between snout and eye, however, GÜNTHER's *rostrata* and GOODE and BEAN's *viola* are as nearly alike as are GÜNTHER's and ZUGMAYER's *rostrata.* As a matter of fact, ZUGMAYER's *rostrata* resembles more COLLETT's *viola* than GÜNTHER's

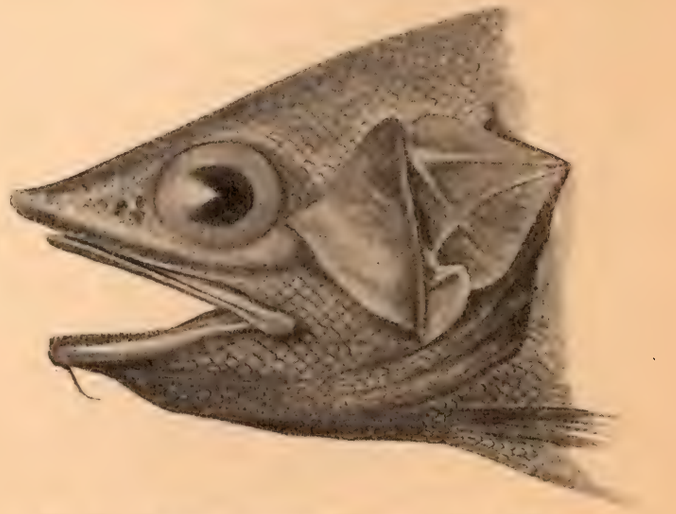


Fig. 45. *Antimora rostrata,* Günther., 51 cm., St. 95. The skin detached from the operculum (²/₃).

| Total length | Length of body | Total length: Ventral to anus | Length of body: Ventral to anus | Total length: Ventral to anal | Length of body: Ventral to anal | Total length: Length of head | Length of body: Length of head | Ventral to anus: Length of head | Ventral to anal: Length of head | Length of head: Length of snout | Length of snout: Horiz. diam. of eye | Horiz. diam. of eye: Vertic. diam. of eye | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | |
| 270 | 240 | 3.60 | 3.20 | 3.42 | 3.04 | 4.22 | 3.75 | 1.17 | 1.23 | 2.78 | 1.35 | 1.21 | "M. S." |
| 350 | 320 | 2.97 | 2.68 | 2.75 | 2.48 | 4.63 | 4.17 | 1.56 | 1.68 | 3.13 | 1.26 | 1.36 | "M. S." |
| 407 | 370 | 2.99 | 2.72 | 2.75 | 2.50 | 4.33 | 3.94 | 1.45 | 1.58 | 3.13 | 1.36 | 1.47 | "M. S." |
| 450 | 403 | 2.85 | 2.53 | 2.53 | 2.26 | 4.21 | 3.77 | 1.49 | 1.66 | 3.57 | 1.20 | 1.47 | "M. S." |
| 510 | 463 | 2.71 | 2.46 | 2.37 | 2.15 | 4.36 | 3.96 | 1.61 | 1.84 | 3.55 | 1.06 | 1.35 | "M. S." |
| 548 | 493 | 2.85 | 2.56 | 2.67 | 2.41 | 4.79 | 4.31 | 1.68 | 1.79 | 3.58 | 1.07 | 1 36 | "M. S." |
| 358 | — | 3.11 | — | — | — | 4.65 | — | 1.49 | — | 3.21 | 1.26 | — | Collett, *viola*, "Hirondelle". |
| | 330 | — | 2.62 | — | — | — | 4.13 | 1.58 | — | 2.96 | 1.35 | — | Zugmayer, *rostrata*, "Pr. Alice". |
| 408 | — | 2.74 | 2.58 | 2.60 | 2.45 | 4.04 | 3.80 | 1.48 | 1.55 | 3.69 | 1.07 | 1.69 | Günther, *viola*, "Challeng". figure. |
| 462 / 600 | — | 2.57 | 2.38 | 2.47 | 2.29 | 5.13 | 4.76 | 2.00 | 2.08 | 3.62 | 1.14 | 1.08 | „ *rostrata* „ „ |
| 480 | 435 | — | — | 2.46 | 2.23 | 4.80 | 4.35 | — | 1.95 | 4.00 | 0.93 | — | Goode and Bean, *viola*. |
| 603 | 545 | — | — | — | — | — | 4.36 | — | — | 4.63 | 0.84 | — | „ „ „ |

As to the specimens described by GÜNTHER it is necessary to remark that the proportions are calculated after the figures on the plates XV and XVI in the "Challenger" report.

*rostrata*, both in that respect and also in the relation between V. — anus and head. In addition, the eye of ZUGMAYER'S *rostrata* is oval.

All this will be clearly seen from the lists following.

First, a comparison is shown between the bodily proportions in 6 of the fish from the "Michael Sars" and those previously described, then a list of the bodily proportions in the whole of the material at our disposal. It consists, in addition to the specimens already described and those from "Michael Sars", also of some which the zoological museums in Oslo and Copenhagen have kindly lent for investigation.

Finally, the measurements of the mentioned material are given.

It remains to add that all have two slight, flexible spines projecting from the hinder edge of the gill cover; these ZUGMAYER describes as half embedded in the skin (No. 92, pag. 122). They are however, as will be seen from the illustration (fig. 45), entirely covered by the skin in all fish save those which have suffered damage. The upper and shorter of the two has the character of a spine. It is an extension from the operculum. The lower one is merely the hinder corner of the sub-operculum, which is pointed.

The number of pyloric appendages varied in the specimens examined from 12 to 14. GÜNTHER gives for *rostrata* 13, for *viola* 16.

Fig. 46. *Antimora rostrata*, Günther. Scale (× 10).

The stomach of one of the 27 cm. long specimens from St. 101 contained foraminifera. On the same fish, behind the last branchial arch, was a parasite crustacean, resembling *Sphyrion* in appearance.

A comparison with *Antimora rhina*, GARMAN (No. 26, pag. 185), and *microlepis*, BEAN (No. 3 a, pag. 38), we have been unable to make.

| Total length | Length of body | Total length: Ventral to anus | Length of body: Ventral to anus | Total length: Ventral to anal | Length of body: Ventral to anal | Total length: Length of head | Length of body: Length of head | Ventral to anus: Length of head | Ventral to anal: Length of head | Length of head: Length of snout | Length of snout: Horiz. diam. of eye (left & right) | Horiz. diam. of eye (left & right): Vert. diam. of eye (left & right) | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | |
| 245 | 221 | 3.14 | 2.81 | 2.85 | 2.53 | 4.22 | 3.76 | 1.34 | 1.48 | 3.00 | 1.20 | 1.28 | "M. S.", St. 95. |
| 255 | 229 | 3.49 | 3.11 | 3.11 | 2.77 | 4.25 | 3.76 | 1.22 | 1.37 | 3.00 | 1.21 | 1.25 | "M. S.", St. 95. |
| 265 | 240 | 3.35 | 3.04 | 2.94 | 2.67 | 4.25 | 4.00 | 1.32 | 1.50 | 3.00 | 1.25 | 1.14 | "M. S.", St. 101. |
| 270 | 240 | 3.60 | 3.20 | 3.42 | 3.04 | 4.22 | 3.75 | 1.17 | 1.23 | 2.78 | 1.35 | 1.21 | "M. S.", St. 101. |
| 270 | 243 | 3.22 | 2.90 | 2.97 | 2.67 | 4.50 | 4.05 | 1.40 | 1.52 | 2.92 | 1.37 | 1.15 | "M. S.", St. 101. |
| 281 | 251 | 3.12 | 2.79 | 2.84 | 2.54 | 4.53 | 4.05 | 1.45 | 1.60 | 2 95 | 1.24 | 0.94 | "Ingolf". |
| 280 | 256 | 3.15 | 2.88 | 2.86 | 2.61 | 4.59 | 4.20 | 1.46 | 1.61 | 3.05 | 1.14 & 1.18 | 1.25 & 1.31 | Smithson., No. 96. (Oslo). |
| 280 | 257 | — | — | 2.67 | 2.45 | 4.52 | 4.15 | — | 1.69 | 2.95 | 1.31 | 1.33 | "M. S.", St. 95. |
| 295 | 265 | 3.28 | 2.94 | 3.04 | 2.74 | 4.68 | 4.20 | 1.43 | 1.54 | 3.15 | 1.14 | 1.17 | "M. S.", St. 101. |
| 294 | 269 | 2.94 | 2.69 | 2.77 | 2.54 | 4.52 | 4.14 | 1.54 | 1.63 | 2.95 | 1.38 | 1.33 | "Ingolf", St. 50. |
| 295 | 269 | 3.15 | 2.87 | 2.89 | 2.64 | 4.34 | 3.81 | 1.38 | 1.50 | 2.96 | 1.24 & 1.28 | 1.28 & 1.36 | Oslo 1345. |
| 313 | 286 | 3.01 | 2.75 | 2.68 | 2.44 | 4.54 | 4.14 | 1.51 | 1.70 | 3.14 | 1.10 | 1.33 | "M. S.", St. 101. |
| 320 | 293 | 3.00 | 2.75 | 2.76 | 2.53 | 4.38 | 4.01 | 1.46 | 1.59 | 3.17 | 1.28 | 1.29 | "M. S.", St. 101. |
| 325 | 296 | 3.25 | 2.96 | 2.93 | 2.67 | 4.39 | 4.00 | 1.35 | 1.50 | 2.96 | 1.35 | 1.32 | "M. S.", St. 101. |
| 330 | 300 | 3.24 | 2.94 | 2.98 | 2.72 | 5.04 | 4.58 | 1.55 | 1.69 | 3.28 | 1.18 | 1.26 | "M. S.", St 25. |
| 345 | 313 | 3.08 | 2.79 | 2.80 | 2.54 | 4.48 | 4.06 | 1.45 | 1.60 | 3.21 | 1.20 | 1.25 | "Ingolf", St. 83. |
| 347 | 313 | 2.97 | 2.68 | 2.75 | 2.48 | 4.63 | 4.17 | 1.56 | 1.68 | 3.13 | 1.26 | 1.36 | "M. S.", St. 101. |
| 355 | 317 | 3.26 | 2.91 | 2.96 | 2.64 | 4.49 | 4.00 | 1.38 | 1.52 | 3.43 | 1.05 | 1.26 | "M. S.", St. 101. |
| 358 | — | 3.11 | — | — | — | 4.65 | — | 1.49 | — | 3.21 | 1.26 | — | "Hirondelle", Collett. |
| 360 | 322 | 2.82 | 3.13 | 2.71 | 2.86 | 4.62 | 4.13 | 1.47 | 1.62 | 3.00 | 1.30 | 1.25 | "M. S.", St. 101. |
| 360 | 322 | 3.18 | 2.81 | 2.86 | 2.56 | 4.39 | 3.93 | 1.38 | 1.54 | 3.04 | 1.29 | 1.40 | "M. S.", St. 101. |
| 360 | 322 | 3.08 | 2.75 | 2.82 | 2.53 | 4.39 | 3.93 | 1.43 | 1.55 | 3.42 | 1.04 | 1.35 | "M. S.", St. 101. |
| 360 | 325 | 3.21 | 2.90 | 2.88 | 2.60 | 4.39 | 3.96 | 1.37 | 1.52 | 3.13 | 1.25 | 1.31 | "M. S.", St. 101. |
| 360 | 327 | 2.98 | 2.70 | 2.73 | 2.48 | 4.29 | 3.89 | 1.44 | 1.57 | 3.11 | 1.23 | 1.26 | "M. S.", St. 101. |
| — | 330 | — | 2.62 | — | — | — | 4.13 | 1.58 | — | 2.96 | 1.35 | — | Zugmayer. |
| 372 | 341 | 2.88 | 2,64 | 2.65 | 2.43 | 4.22 | 3.87 | 1.46 | 1.59 | 3.39 | 1.13 & 1.16 | 1.28 & 1.26 | Oslo 585. |
| 380 | 345 | 3.06 | 2.77 | 2.77 | 2.52 | 4.69 | 4.26 | 1.53 | 1.69 | 3.12 | 1.30 | 1.25 | "M. S.", St. 101. |
| 397 | 362 | 2.94 | 2.68 | 2.76 | 2.51 | 4.56 | 4.16 | 1.55 | 1.66 | 3.48 | 1.15 | 1.28 | "Ingolf", St. 93. |
| 395 | 365 | 3.04 | 2.81 | 2.71 | 2.50 | 4.82 | 4.45 | 1.59 | 1.78 | 3.28 | 1.14 | 1.22 | "Ingolf", St. 83. |
| 407 | 370 | 2.99 | 2.72 | 2.75 | 2.50 | 4.33 | 3.94 | 1.45 | 1.58 | 3.13 | 1.36 | 1.47 | "M. S.", St. 95. |
| 408 | (384) | (2.74) | (2.58) | (2.60) | (2.45) | (4.04) | (3.80) | (1.48) | (1.55) | (3.69) | (1.07) | (1.69) | "Challenger", *viola* after Pl. XV, fig. |
| 446 | 397 | 2.86 | 2.54 | 2.59 | 2.31 | 4.55 | 4.05 | 1.59 | 1.76 | 3.27 | 1.20 | 1.19 | "M. S.", St. 95. |
| 450 | 403 | 2.85 | 2.53 | 2.53 | 2.26 | 4.21 | 3,77 | 1.49 | 1.66 | 3.57 | 1.20 | 1.47 | "M. S.", St. 101. |
| 462 | — | (2.57) | (2.38) | (2.47) | (2.29) | (5.13) | (4.76) | (2.00) | (2.08) | (3.62) | (1.14) | (1.08) | "Challenger" *rostrata* after Pl. XVI, fig. A. |
| 472 | 421 | 2.91 | 2.60 | 2.59 | 2.31 | 4.50 | 4.01 | 1.54 | 1.74 | 3.31 | 1.28 | 1.24 | "M. S.", St. 95. |
| 470 | 425 | 2.85 | 2.58 | 2.64 | 2.39 | 4.43 | 4.00 | 1 55 | 1.68 | 3.12 | 1.39 | 1.29 | "M. S.", St. 95. |
| 475 | 432 | 2.73 | 2.43 | 2.39 | 2.17 | 4.44 | 4.04 | 1.63 | 1.86 | 3.45 | 1.15 & 1.11 | 1.35 & 1.56 | Smithson. 880. Oslo 24747. |
| 483 | 433 | 2.96 | 2.66 | 2.71 | 2.43 | 4.39 | 3.94 | 1.48 | 1.62 | 3.24 | 1.31 | 1.44 | "M. S.", St. 95. |
| 480 | 435 | — | — | 2.46 | 2.23 | 4.80 | 4.35 | — | 1.95 | 4.00 | 0.93 | — | Goode & Bean, *viola*. Ocean. Ichty. |
| 490 | 440 | 2.90 | 2.60 | 2.71 | 2.43 | 4.26 | 3.83 | 1.47 | 1.57 | 3.48 | 1.22 | 1.23 | "M. S.", St. 95. |
| 510 | 463 | 2.71 | 2.46 | 2.37 | 2.15 | 4.36 | 3.96 | 1.61 | 1.84 | 3.55 | 1.06 | 1.35 | "M. S.", St. 95. |
| 517 | 464 | 2.92 | 2.62 | 2.61 | 2.34 | 4.50 | 4,03 | 1.54 | 1.72 | 3.48 | 1.22 | 1.29 | "M. S.", St. 95. |
| 548 | 493 | 2.85 | 2.56 | 2.67 | 2.41 | 4.79 | 4.31 | 1.68 | 1.79 | 3.58 | 1.07 | 1.36 | "M. S.", St. 95. |
| 555 | 504 | 2.76 | 2.51 | 2.57 | 2.33 | 4.43 | 4.02 | 1.60 | 1.72 | 3.35 | 1.25 | 1.36 | "M. S.", St. 95. |
| 562 | 508 | 2.75 | 2.50 | 2.54 | 2.30 | 4.63 | 4.18 | 1.68 | 1.82 | 3.74 | 1.08 | 1.36 | "M. S.", St. 95. |
| | After the same fig. as spec. | | | | | | | | | | | | |
| 600 | 462 mm. | (2.57) | (2.38) | (2.47) | (2.29) | (5.13) | (4.76) | (2.00) | (2.08) | (3.71) | (1.05) | (1.15) | "Chall". *rostrata*. Pl. XVI, fig. A. |
| 603 | 545 | — | — | — | — | — | 4.36 | — | — | 4.63 | 0.84 | — | G. & B., *viola*. Ocean. Ichty. |

| Total length | Length of body | Height of body | Ventral to anus | Ventral to anal | Length of head | Length of snout | Horizont. diam. of eye. | Vertical diam. of eye | Interorbital space | Tip of snout to first dorsal | Snout to anus | Snout to anal | Snout to ventral | Anus to base of caudal | Eye to anus | Gill-cover to anus | Length of first dorsal ray | Length of second ventral ray | Length of pectoral | Base of anal | Number of appendices pyloricæ | Sex | Material |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | | | | | | | | | | | | | |
| 245 | 218 | 37 | 78 | 86 | 58 | 19.5 | 16 | 12.5 | 16 | 63 | 119 | 127 | 42 | 105 | 91.5 | 69 | 60 | 47 | 37 | 78 | 12 | ♀ | "M. S." St. 95. |
| 255 | 227 | 39 | 73 | 82 | 60 | 20 | 16.5 | 13.2 | 16 | 61.5 | 119 | 128 | 47 | 112 | — | 65 | 62 | 58 | 38 | 80 | 14 | ♀ | "M. S." St. 95. |
| 265 | 240 | — | 79 | 90 | 60 | 20 | 16 | 14 | 14.5 | 65 | 126 | 137 | — | 122 | — | 72 | — | — | — | — | — | — | "M. S." St. 101. |
| 270 | 240 | — | 75 | 79 | 64 | 23 | 17 | 14 | 17 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 270 | 243 | — | 84 | 91 | 60 | 20.5 | 15 | 13 | — | — | — | — | — | — | — | — | — | — | — | — | 14 | ♂ | "M. S." St. 101. |
| 281 | 251 | — | 90 | 99 | 62 | 21 | 17 | 18 | 16 | — | — | — | — | — | — | — | — | — | — | — | — | — | "Ingolf". |
| 280 | 256 | — | 89 | 98 | 61 | 20 | 17.5 | 14 | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | Smithson. 96. Oslo. |
| 280 | 257 | 51 | — | 105 | 62 | 21 | 16 | 12 | 15 | 69 | 142 | — | — | 124 | 110 | 86 | — | — | — | — | — | — | "M. S." St. 95. |
| 295 | 265 | — | 90 | 97 | 63 | 20 | 17.5 | 15 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 294 | 269 | — | 100 | 106 | 65 | 22 | 16 | 12 | 20 | — | — | — | — | — | — | — | — | — | — | — | — | — | "Ingolf" St. 50. |
| 295 | 269 | — | 93.7 | 102 | 68 | 23 | 18.5 | 14.5 | 18 | — | — | — | — | — | — | — | — | — | — | — | — | — | Oslo 1345. |
| 313 | 286 | — | 104 | 117 | 69 | 22 | 20 | 15 | 18.5 | — | — | — | — | — | — | — | — | — | — | — | — | ♀ | "M. S." St. 101. |
| 320 | 293 | — | 106.5 | 116 | 73 | 23 | 18 | 14 | 21 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 325 | 296 | — | 100 | 111 | 74 | 25 | 18.5 | 14 | 21 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 330 | 300 | 54.5 | 101.8 | 110.5 | 65.5 | 21.5 | 18.2 | 14.5 | — | 73 | 152 | — | — | — | — | — | — | — | — | — | 13 | ♀ | "M. S." St. 25. |
| 345 | 313 | — | 112 | 123 | 77 | 24 | 20 | 16 | 21 | — | — | — | — | — | — | — | — | — | — | — | — | — | "Ingolf" St. 83. |
| 347 | 313 | 60 | 117 | 126 | 75 | 24 | 19 | 14 | 21 | 85 | 176 | 185 | 66 | 146 | — | 106 | 78 | 70 | 54 | 113 | — | — | "M. S." St. 101. |
| 355 | 317 | — | 109 | 120 | 79 | 23 | 22 | 17.5 | 21.1 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 358 | — | 58 | 115 | — | 77 | 24 | 19 | — | — | — | 175 | — | 65 | — | — | — | 68 | 50 | 67 | 124 | — | — | Collett, *viola*, "Hirondelle". |
| 360 | 322 | — | 115 | 126 | 78 | 26 | 20 | 16 | 22.2 | — | — | — | — | — | — | — | — | — | — | — | 14 | juv.♂ | "M. S." St. 101. |
| 360 | 322 | — | 113 | 126 | 82 | 27 | 21 | 15 | 23 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 360 | 322 | — | 117 | 127.5 | 82 | 24 | 23 | 17 | 24 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 360 | 325 | — | 112 | 125 | 82 | 26.2 | 21 | 16 | 23.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 360 | 327 | — | 121 | 132 | 84 | 27 | 22 | 17.5 | 24.8 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| | 330 | atV. atAn. 55 60 | 126 | — | 80 | 27 | 20 | — | 20 | 92 | 184 | — | — | — | — | — | — | — | — | — | — | — | Zugmayer, *rostrata*, "Pr. Alice". |
| 372 | 341 | — | 129 | 140.5 | 88.2 | 26 | 23 | 18 | 23.2 | — | — | — | — | — | — | — | — | — | — | — | — | — | Oslo 585. |
| 380 | 345 | — | 124 | 137 | 81 | 26 | 20 | 16 | 23 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 101. |
| 397 | 362 | — | 135 | 144 | 87 | 25 | 21.7 | 17 | 24.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | "Ingolf" St. 93. |
| 395 | 365 | — | 130 | 146 | 82 | 25 | 22 | 18 | 23.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | "Ingolf" St. 83. |
| 407 | 370 | — | 136.2 | 148.2 | 94 | 30 | 22 | 15 | 25 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 95. |
| 408 | 384 | — | 149 | 157 | 101 | 27.4 | 25.5 | 15.1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Günther, *viola*, "Challeng". fig. |
| 446 | 397 | — | 156 | 172 | 98 | 30 | 25 | 21 | 31 | — | — | — | — | — | — | — | — | — | — | — | — | ♀ | "M. S." St. 95. |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 450 | 403 | at $D_1$ 90 | 159 | 178 | 107 | 30 | 25 | 17 | 31 | 114 | 244 | 263 | 85 | 179 | — | 140 | 91 | 85 | 86 | 129 | — | — | "M. S." St. 101. |
| 472 | 421 | — | 162 | 182.5 | 105 | 31.7 | 24.7 | 20 | 29 | — | — | — | — | — | — | — | — | — | — | — | 12 | ♀ VII | "M. S." St. 95. |
| 470 | 425 | — | 165 | 178 | 106.2 | 34 | 24.5 | 19 | 30 | — | — | — | — | — | — | — | — | — | — | — | 14 | ♀ VII | "M. S." St. 95. |
| 475 | 432 | — | 174 | 199 | 107 | 31 | 27 | 20 | 28 | — | — | — | — | — | — | — | — | — | — | — | — | — | Smithson. 880. Oslo 24747. |
| 483 | 433 | — | 163 | 178 | 110 | 34 | 26 | 18 | 32 | — | — | — | — | — | — | — | — | — | — | — | 12 | ♀ | "M. S." St. 95. |
| 480 | 435 | 83 | — | 195 | 100 | 25 | 27 | — | 27 | 113 | — | 266 | 71 | — | — | — | 107 | 92 | 83 | 142 | — | — | Goode and Bean, *viola.* |
| 490 | 440 | — | 169 | 181 | 115 | 33 | 27 | 22 | 33 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 95. |
| 510 | 463 | — | 188 | 215 | 117 | 33 | 31 | 23 | 30 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 95. |
| 517 | 464 | — | 177 | 198 | 115 | 33 | 26 | 19 | 31 | — | — | — | — | — | — | — | — | — | — | — | — | ♀ | "M. S." St. 95. |
| 548 | 493 | — | 192.5 | 205 | 114.5 | 32 | 30 | 22 | 35 | — | 287 | — | — | 228 | 236 | 181 | — | — | — | — | 14 | ♀ | "M. S." St. 95. |
| 555 | 504 | — | 201 | 216 | 125.4 | 37.5 | 30 | 22 | 39 | — | 297 | — | — | 237 | 250 | 191 | — | — | — | — | — | — | "M. S." St. 95. |
| 562 | 508 | — | 204 | 221 | 121.5 | 32.5 | 30 | 22 | 38 | — | — | — | — | — | — | — | — | — | — | — | — | — | "M. S." St. 95. |
| (390) | (362) | — | (152) | (158) | (76) | (21) | (18.4) | (16.1) | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Günther, *rostrata*, "Challeng." fig. |
| 603 | 545 | — | — | — | 125 | 27 | 32 | — | 35 | 136 | — | — | — | — | — | — | 140 | — | 105 | — | — | — | Goode and Bean, *viola.* |

The measurements on *Antimora* from the "Challenger" expedition are made on the drawings not on the fishes.

### ***Phycis blennioides,*** Brünn.

1862. *Phycis blennioides,* (Brünnich), Günther (No. 41, IV, pag. 351).
1878—1907. *Phycis blennioides,* (Brünnich), Winther, Hansen & Jensen (No. 91, pag. 78, pl. IX, fig. 10).

2 specimens, 19.5 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

1 specimen, St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

1 specimen, 57 cm., ♀, St. 4, 11/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

12 specimens, 1 smaller than 17 cm., 17, 18, 26, 34, 38, 39, 40, 41, 41, 41 and 59 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

The specimen from St. 4, has only 8 rays in the first dorsal fin, whereas the others investigated had 10, of which some were prolonged. The shorter of the two rays in the ventral fins reaches back to the anal, the longest extending as far as the 8th anal ray. There are 6 rows of scales between the first dorsal fin and the lateral line (fig. 47), and about 100 scales in the lateral line

Fig. 47. *Phycis blennioides,* Brünn., 38.5 cm. Scale (× 10).

itself. The lateral line lies along over these in a channel which is partially ossified (fig. 48). Where this is the

Fig. 48. *Phycis blennioides,* Brünn., 38.5 cm. Scale from lateral line (× 10).

case, the scales present the appearance of ending in a spine (conf. No. 91, pag. 78, pl. IX, fig. 10 b). One of those taken at St. 21 had isopoda, *Galathea,* and a large shrimp, possibly *Sergestes,* in its stomach.

***Mora mora***, Risso.

70 specimens, 23—61 cm., St. 4, 11/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

36 specimens, 29—58 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m.

4 specimens, 50—60 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m.

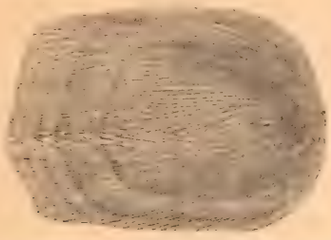


Fig. 49. *Mora mora*, Risso, 38 cm. Scale (× 5).

Of 33 from St. 23, the 20 were ♂ and 13 ♀, all spent. Of 22 from St. 4, 15 were ♂ and 7 ♀. The measurements from St. 4 fall as follows:

| | | | |
|---|---|---|---|
| 23 cm. | 1 specimen | 44 cm. | 1 specimen |
| 32 „ | 4 „ | 45 „ | 1 „ |
| 33 „ | 4 „ | 46 „ | 6 „ |
| 34 „ | 3 „ | 47 „ | 3 „ |
| 35 „ | 4 „ | 50 „ | 1 „ |
| 36 „ | 2 „ | 51 „ | 1 „ |
| 37 „ | 7 „ | 52 „ | 1 „ |
| 38 „ | 4 „ | 53 „ | 2 „ |
| 39 „ | 3 „ | 54 „ | 1 „ |
| 40 „ | 1 „ | 55 „ | 3 „ |
| 41 „ | 4 „ | 57 „ | 1 „ |
| 42 „ | 7 „ | 58 „ | 1 „ |
| 43 „ | 3 „ | 61 „ | 1 „ |

***Lepidion eques***, (Günther).

1887. *Haloporphyrus eques*, Günther (No. 43, pag. 91, pl. XVIII, fig. B).
1905 (09). *Lepidion eques*, (Günther), Collett (No. 14 b, pag. 69).
1919. *Haloporphyrus lepidion, var. eques*, (Günther), Roule (No. 79 c, pag. 78).

Abt. 40 specimens, 9—23 cm., St. 4, 11/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

1 specimen, 7 cm., St. 101, 6-7/8, N. 57° 41′, W. 11° 48′, 1853 m., hard clay; captured in 3/4 m. silknet with 1500 m. wire.

Longitudinal diameter of eye nearly one-third the length of the head, larger than snout, and interorbital distance. The pectoral fin longer than the ventral. This is seen from the measurements taken of a specimen 30 cm. long.

Length of head 63 mm.
Horiz. diam. of eye 23 mm. Proportion to head as 1 : 2.74.
Length of snout 19 mm. Proportion to eye horiz. 1 : 1.22.
Interorbital distance 14. Proportion to eye horiz. 1 : 1.64.
P. length 50 mm.
V. length 35 mm.
The lateral line has about 180 scales, and between

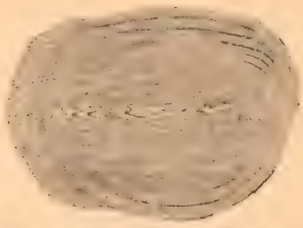


Fig. 50. *Lepidion eques*, Günth., 31 cm. Scale (× 10).

the 1st dorsal fin and the lateral line there are 14—16 scales (fig. 50). It should also be noted that the air-bladder is divided into two parts, which are joined together by a small tubelike portion up under the spinal column. The foremost section has two wide horns which are continued out to the right and left ear.

17 of the largest specimens measured as follows:

| | | | |
|---|---|---|---|
| 1 specimen | 22 cm. | 6 specimens | 27 cm. |
| 1 „ | 23 „ | 3 „ | 28 „ |
| 2 „ | 25 „ | 1 „ | 29 „ |
| 1 „ | 26 „ | 2 „ | 31 „ |

Of which 7 ♀ and 10 ♂.

Measurements and number of rays of the young specimen taken pelagically at a depth of about 1000 m. East of the Rockall bank.

It will be seen that the prolonged ray in the first dorsal is considerably shorter than that of the older specimens.

| | | |
|---|---|---|
| Total length | 72 | mm. |
| Length of body | 64 | „ |
| Ventral fin to anal fin | 13.5 | „ |
| Length of head | 15 | „ |
| Length of eye | 5 | „ |
| Length of snout | 4 | „ |
| Interorbital space | 3.7 | „ |
| Length of barbel | 1.5 | „ |
| Distance between second dorsal and caudal fin | 3.5 | „ |
| Height of caudal peduncle | 2 | „ |

Number of rays in first dorsal 6.
The second ray in first dorsal is the longest and measures ..... about 9 „
Number of rays in second dorsal 56.
Number of rays in pectoral 21.

Length of pectoral ..... about 11 mm.
Length of ventral..... about 10 „

Number of rays in ventral 8.

The two outermost rays in ventral are prolonged, the second is the longest.

Number of branchiostegal rays 7.

After ROULE (No. 79 c, pag. 78) *Lepidion eques,* (GÜNTHER) is only a variety of RISSO's *Gadus lepidion.* (No. 76, pag. 118).

## SUBORDER ACANTHOPTERYGII.

### DIVISION PERCIFORMES.

#### *Berycidæ.*

***Hoplostethus mediterraneum,*** Cuv. & Val.

1839 (1843—60). *Trachichthys pretiosus,* Lowe (No. 62, pag. 55, pl. IX).
1881. *Hoplostethus mediterraneus,* (Cuvier & Valenciennes), Moreau (No. 67 II, pag. 322).
1887. „ *mediteraneum,* (Cuvier & Valenciennes), Günther (No. 43, pag. 21).
1888. „ *mediterraneus,* (Cuvier & Valenciennes), Vaillant (No. 86, pag. 378, pl. pl. XXVII, fig. 5).

3 specimens, 9 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

30 specimens, 5—15 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

D. VI 13, A. III 10.

Total length 90 mm.
Length of body 68 mm.
Length of head 26 mm., proport. to total 1 : 3.46, proport. to length of body 1 : 2.62.
Length of eye 9 mm., proport. to length of head 1 : 2.89.

Total length 120 mm.
Length of body 90 m.
Length of head 35 mm., proport. to total 1 : 3.43, proport. to length of body 1 : 2.57.
Length of eye 12 mm., proport. to length of head 1 : 2.92.

#### *Serranidæ.*

***Serranus cabrilla,*** Lin.

1828. *Serranus cabrilla,* (Linné), Cuvier & Valenciennes (No. 18, II, pag. 223, pl. XXIX).
1859. „ „ „ Günther (No. 41, I, pag. 106).
1880-84. „ „ „ Day (No. 19, I, pag. 14, pl. IV).
1895. „ „ „ Boulenger (No. 7, a, I, sec. ed. pag. 283).

3 specimens, 17—21 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

D. X 14, A. III 7.

#### *Sciænidæ.*

***Sciæna aquila,*** Lacépède.

1860. *Sciæna aquila* (Lacépède), Günther (No. 41, II, pag. 291).

2 specimens, 20—22 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

D. X + I 29, A. II 7, lat. line abt. 54.

| | | |
|---|---|---|
| Total length ..... | 202 mm. | 215 mm. |
| Height of body ..... ..... | 47 „ | 55 „ |
| Length of head ..... ..... . | 52 „ | 54 „ |
| Horiz. diam. of eye ..... | 10 „ | 11.5 „ |

***Umbrina ronchus,*** Val.

1836-44. *Umbrina ronchus,* Valenciennes (No. 87, pag. 24).
1860. „ „ (Valenciennes), Günther (No. 41, II, pag. 275).
1881. „ *lafonti,* Moreau (No. 67, II, pag. 395, fig. 126).
1906. „ *ronchus,* (Valenciennes), Pietschmann (No. 70, pag. 104).

21 specimens, 11—15 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

D. X + II 27, A. II 8, V. I 5, lat. line 60, transv. 7/15.

Total length 112 mm.
Height of body 31 mm., proport. to total length as 1 : 3.62.
Length of head 26 mm., proport. to total length as 1 : 4.31.
Horiz. diam. of eye 7 mm., proport. to length of head as 1 : 3.72.
One of them had the stomach full of young clupeids.

#### *Pristipomatidæ.*

***Pristipoma bennettii,*** (Lowe).

1836-44. *Pristipoma bennettii,* (Lowe), Valenciennes (No. 87, pag. 26).
1859. „ „ „ Günther (No. 41, I, pag. 298).
1891. „ „ „ Moreau (No. 67, Suppl. pag. 37, fig. 226).

Many specimens, St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

D. XII 16, A. III 11—13, lat. line 53, transv. $^{8}/_{15}$, app. pyl. 7.

Total length 155 mm.

Height of body 45 mm., proport. to total length 1 : 3.44.

Length of head 42 mm.

Length of snout 13 mm.

Horiz. diam. of eye 11.5 mm., proport. to length of head 1 : 3.66, proport. to length of snout 1 : 1.13.

Length of fourth dorsal spine 19 mm., proport. to length of head 1 : 2.21.

Length of pectoral fin 36 mm., proport. to total length 1 : 4.30.

***Diagramma mediterraneum,*** Guichenot.

2 specimens, 58—65 cm., from Canary islands.

D. XII 17, A. III 8.

Total length 580 mm.

Height of body 170 mm.; proportion to total length 1 : 3.41.

Length of head 155 mm.; proportion to total length 1 : 3.74.

Horiz. diam. of eye 30 mm.: proportion to length of head 1 : 5.17.

Total length 650 mm.

Height of body 190 mm.; proportion to total length 1 : 3.42.

Length of head 175 mm.; proportion to total length 1 : 3.71.

Horiz. diam. of eye 31.2 mm.; proportion to length of head 1 : 5.61.

## *Sparidæ.*

***Dentex vulgaris,*** Cuv. & Val.

1830. *Dentex vulgaris,* Cuvier & Valenciennes (No. 18, vol. VI, pag. 220, pl. 153).
1859. „ „ (Cuvier & Valenciennes), Günther (No. 41, I, pag. 366).

4 specimens, 38—55 cm., Canary islands.

D. XII 10, A. III 8, lat. line 60, transv. $^{7}/_{16}$, canine teeth $^{4}/_{6}$, app. pyl. 4.

The stomach of one of the specimens contained a *Solea lutea.*

Total length 390 mm.

Height of body 122 mm.; proportion to total length 1 : 3.20.

Length of head 99 mm.; proportion to total length 1 : 3.94.

Length of snout 38 mm.

Horiz. diam. of eye 21 mm.; proportion to length of head 1 : 4.72; proportion to length of snout 1 : 1.81.

Fourth dorsal spine 53 mm.; proportion to length of head 1 : 1.87.

***Dentex macrophthalmus,*** Bloch.

1830. *Dentex macrophthalmus,* (Bloch), Cuvier & Valenciennes (No. 18, VI, pag. 227).
1859. „ „ (Bloch), Günther (No. 41, I, pag. 370).
1881. „ „ (Bloch), Moreau (No. 67, III, pag. 59, fig. 151).
1888. „ „ (Bloch), Vaillant (No. 86, pag. 358).

5 specimens, 18—22 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

1 specimen, 7 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

250 specimens, 8—30 cm., St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

D. XII 9—10, A. III 8, lat. line 53—55, canine teeth $\frac{4—6}{10—12}$

| Total length mm. | Height of body | Length of head | Horiz. diam. of eye | Inter-orbital space | Length of fourth dorsal spine |
|---|---|---|---|---|---|
| 67 | 19 | 20 | 6.7 | 5.5 | — |
| 80 | 22 | 24.3 | 9 | 6.2 | — |
| 84 | 22 | 23.8 | 8.6 | 6.2 | — |
| 107 | 28.1 | 31 | 11 | 7 | — |
| 177.5 | 53 | 51 | 18 | 13 | 22 |
| 195 | 61 | 58 | 19.9 | 14.8 | 21 |
| 197.5 | 62 | 55.5 | 18.8 | 16.0 | — |
| 210 | 68 | 60 | 19 | 14.3 | 27 |
| 215 | 72.1 | 61 | 21 | 18 | 28 |
| 242 | 85 | 69.5 | 25.2 | 18 | 33 |
| 255 | 83.5 | 71 | 26 | 18.5 | 31 |
| 277 | 87 | 76 | 27 | 20.5 | 33 |

| Total length mm. | Total length: Height of body | Total length: Length of head | Length of head: Horiz. diam. of eye |
|---|---|---|---|
| 67 | 3.52 | 3.35 | 2.99 |
| 80 | 3.64 | 3.30 | 2.70 |
| 84 | 3.82 | 3.53 | 2.77 |
| 107 | 3.80 | 3.45 | 2.82 |
| 177.5 | 3.35 | 3.48 | 2.84 |
| 195 | 3.20 | 3.36 | 2.92 |
| 197.5 | 3.19 | 3.56 | 2.96 |
| 210 | 3.09 | 3.50 | 3.16 |
| 215 | 2.98 | 3.52 | 2.90 |
| 242 | 2.85 | 3.48 | 2.76 |
| 255 | 3.06 | 3.60 | 2.73 |
| 277 | 3.18 | 3.65 | 2.82 |

The otoliths of a specimen 16 cm. show clearly three zones of growth.

### *Dentex maroccanus,* Cuv. & Val.

1830. *Dentex maroccanus,* Cuvier & Valenciennes (No. 18, VI pag. 234).
1906. „ „ (Cuvier & Valenciennes), Pietschmann. (No. 70, pag. 102).

3 specimens, 24—26 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

1 specimen, 15 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

D. XII 10, A. III 8, lat. line 48—50, canine teeth $^{4}/_{6}$, app. pyl. 4.

| Total length | Height of body | Length of head | Length of snout | Horiz. diam. of eye | Interorbital space | Length of pectoral | Length of ventral | Length of 4th dorsal spine |
|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | |
| 150 | 43.5 | 42 | 12 | 15 | 9 | — | — | 18 |
| 235 | 80 | 65 | 19.5 | 19.5 | 14.5 | — | — | 33 |
| 255 | 87 | 66 | — | 19 | 17 | 65 | 47 | 34 |
| 260 | 88 | 73 | 27 | 20 | 15.7 | — | — | 38 |

| Total length | Total length: Height of body | Total length: Length of head | Length of head: Horiz. diam. of eye | Length of head: Interorbital space |
|---|---|---|---|---|
| mm. | | | | |
| 150 | 3.45 | 3.58 | 2.80 | 4.67 |
| 235 | 2.94 | 3.62 | 3.33 | 4.48 |
| 255 | 2.94 | 3.86 | 3.47 | 3.88 |
| 250 | 2.96 | 3.56 | 3.65 | 4.65 |

The pectoral fin reaches the origin of the anal or the soft rays of that fin. The ventral fins end just before or just behind anus.

### *Cantharus lineatus,* Montagu.

3 specimens, 32—48 cm., Canary islands.

2 specimens, 16—18 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

D. XI 12, A. III 10, lat. line 76.

### *Box vulgaris,* Cuv. & Val.

1830. *Box vulgaris,* Cuvier & Valenciennes (No. 18, VI, pag. 348, pl. 161).
1859. „ „ (Cuvier & Valenciennes), Günther (No. 41, I, pag. 418).
1880—84. *Box vulgaris* (Cuvier & Valenciennes), Day (No. 19, I, pag. 28, pl. X).

2 specimens, 14—16 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

D. XIV 14, A. III 15, app. pyl. 4—5, lat. line 75.

### *Sargus rondeletii,* Cuv. & Val.

1830. *Sargus rondeletii,* Cuvier & Valenciennes (No. 18, VI, pag. 14, pl. 141).
1859. „ „ (Cuvier & Valenciennes), Günther (No. 41, I, pag. 440).

2 specimens, 23—24 cm., Canary islands.

D. XII 14, A. III 14, P. 16, incisors $^{8}/_{8}$, molars in 2 series, lat. line 63, app. pyl. 5.

Total length 240 mm.

Height of body 86 mm.; proportion to total length 1 : 2.79.

Length of head 65.5 mm.

Length of snout 24 mm.

Horiz. diam. of eye 18 mm.; proportion to length of head 1 : 3.64; proportion to length of snout 1 : 1.33.

Interorbital space 21.5 mm.

Length of 2nd and 3rd anal spine 18 mm., the second is the strongest.

Pectoral fin reaches the soft rays of the anal, ventral fins reach nearly the anus.

### *Sargus annularis,* Lin.

1830. *Sargus annularis,* (Linné), Cuvier & Valenciennes (No. 18, VI, pag. 35, pl. 142).
1859. „ „ (Linné), Günther (No. 41, I, pag. 445).
1881. „ „ (Linné), Moreau (No. 67, III, pag. 9).
1906. „ „ (Linné), Pietschmann (No. 70, pag. 109).

Many small specimens about 6—17 cm., from the seining of Spanish fishermen near Cap Bojador, St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

D. XI 14, A. III 15, lat. line 55, incisors $^{8}/_{8}$, molars in 2 series, app. pyl. 5.

Total length 147 mm.

Length of body 119 mm.

Height of body 55 mm.; proportion to total length 1 : 2.68.

Length of head 38 mm.; proportion to total length 1 : 3.87.

Length of snout 12 mm.

Horiz. diam. of eye 11 mm.; proportion to length of head 1 : 3.45.

Interorbital space 10 mm.

Length of third anal spine 11.5 mm.

The eye is relatively large in these young fish.

The pectorals extend to the anal fin, the ventrals do not reach to the anus. The second anal spine is stronger, but not longer, than the third.

The back is golden, and there are longitudinal yellow stripes on the sides; there is also a black longitudinal

stripe down the middle of the side. Above the caudal peduncle, there is a black transverse band, which passes over the back, and is thus almost ring-shaped, but does not extend out on the dorsal and anal fins.

On the shoulder, and at the angle of the pectoral fin, there is a black spot; the short ventral fins, however, are devoid of colouring; only in a single specimen was a round black spot found between the ventral fins and on their inner side; otherwise, they were light in colour.

***Chrysophrys aurata,*** Lin.

1830. *Chrysophrys aurata,* (Linné), Cuvier & Valenciennes (No. 18, VI, pag. 85, pl. 145).
1859. „ „ (Linné), Günther (No. 41, I, pag. 484).

1 specimen, 47 cm., Canary islands.

D. XI 14, A. III 11, lat. line 76, canine teeth $^{6}/_{6}$.

***Pagrus vulgaris,*** Cuv. & Val.

1830. *Pagrus vulgaris,* Cuvier & Valenciennes (No. 18, VI, pag. 142, pl. 148).
1859. „ „ (Cuvier & Valenciennes), Günther (No. 41, I, pag. 466).

2 specimens, 22—23 cm., Canary islands.

1 specimen, 50 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

1 specimen, 43 cm., St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

D. XII 10, A. III 8, lat. line 54—56, canine teeth $^{4}/_{4\text{-}6}$, 2 series of molars.

The pectoral fin reaches the first or the third soft ray of the anal.

Total length about 430 mm.

Height of body 132 mm.; proportion to total length 1 : 3.26.

Length of head 107.5 mm.; proportion to total length 1 : 4.00.

Length of snout 45 mm.

Horiz. diam. of eye 24 mm.; proportion to length of snout 1 : 1.88; proportion to interorbital space 1 : 1.33.

Interorbital space 32 mm.

***Pagellus centrodontus,*** Cuv. & Val.

1 specimen from Portuguese fisherman, St. 13, 22/4, N. 41° 32′, W. 9° 05′, 78 m.

7 specimens, 23—28 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

D. XII 12, A. III 12, lat. line 73.

***Pagellus acarne,*** Cuv.

1859. *Pagellus acarne,* (Cuvier), Günther (No. 41, I, pag. 480).

1 specimen, 32 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

D. XII 10, A. III 10, lat. line 73.

## *Mullidæ.*

***Mullus surmuletus,*** Lin.

11 specimens, 23—29 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

1 specimen, St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

1 specimen, St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

## *Caproidæ.*

***Capros aper,*** Lacép.

52 specimens, 12—17 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

2 specimens, 8—9 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

About 30 specimens, about 7—10 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

A few specimens, St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

## *Labridæ.*

***Coris julis,*** Lin.

1 specimen, 18 cm., St. 37, N. 26° 6′, W. 14° 33′, 39 m., shingle.

D. IX 12, A. III 12, lat. line 75.

# DIVISION SCOMBRIFORMES.

## *Carangidæ.*

***Caranx trachurus,*** Lin.

1833. *Scomber sive Caranx trachurus,* (Linné), Cuvier & Valenciennes (No. 18, IX, pag. 11, pl. 246).
1860. *Trachurus trachurus,* (Linné), Günther (No. 41, II, pag. 419).
1881. „ „ (Linné), Moreau (No. 67, II, pag. 437).
1880—84. *Caranx* „ (Linné), Day (No. 19, I, pag. 124, pl. XLIV).
1892. *Caranx trachurus,* (Linné), Smitt (No. 82, I, pag. 86, pl. V, fig. 3).

184 specimens, 18—24 cm., St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

2 specimens, 39—41 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

1 specimen, 16 cm., St. 14, 22/4, N. 41° 15′, W. 8° 54′, 69 m.

8 specimens, 16—18 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

About 100 specimens, 5—21 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

2 specimens, St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

D. VIII + I 29, A. II + I 26, spiny scales in lateral line 36.

St. 36. Total length 205 mm.

Height of body 45 mm.; proportion to total length 1 : 4.56.

Length of head 51 mm.; proportion to total length 1 : 4.02.

Length of pectoral fin 49 mm.; proportion to total length 1 : 4.19.

***Temnodon saltator,*** Cuv. & Val.

1833. *Temnodon saltator,* Cuvier & Valenciennes (No. 18, IX. pag. 225, pl. 260).
1836—44. „ „ ( „ „ ), Valenciennes (No. 87, pag. 58, pl. 13, fig. 2).
1860. „ „ ( „ „ ), Günther (No. 41, II, pag. 479).

1 specimen, 19 cm., St. 36, 20/5, N. 26° 12′, W. 14° 26′, 10 m.

## *Trichiuridæ.*

***Lepidopus caudatus,*** Euphr.

1 specimen, 107 cm., St. 43, 27/5, N. 28° 2′, W. 17° 18′, from a Spanish fisherman.

## DIVISION ZEORHOMBI.

## *Zeidæ.*

***Zeus faber,*** Lin.

1 specimen, 28 cm., St. 1, 9/4, N. 49° 27′, W.8° 36′, 146 m. fine sand.

4 specimens, two of them measured 38 and 40 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

## *Pleuronectidæ.*

***Hippoglossus vulgaris,*** Flem.

1 specimen, 74 cm., received from a French fisherman at St. 72, 1/7, N. 44° 35′, W. 51° 15′, 75 m.

Estimated from the otolith as 7 years old.

***Arnoglossus laterna,*** Willughby.

1862. *Arnoglossus laterna,* (Willughby), Günther (No. 41, IV, pag. 415).
1889. „ „ „ „ (No. 45, pag. 42, pl. III, fig. C).
1913. „ „ „ Kyle (No. 59, pag. 64, fig. 9).

2 specimens, 8—11 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

D. 93, A. 73.

***Arnoglossus imperialis,*** Raf.

1862. *Arnoglossus lophotes,* Günther (No. 41, IV, pag. 417).
1890. „ „ „ (No. 45, pag. 40, pl. III, fig. B).
1890. „ *laterna,* (non Willughby), Cunningham (No. 45, pag. 540).
1896. „ *lophotes,* (Günther), Collett (No. 13 b, pag. 95, pl. III, fig. 13).
1913. „ *imperialis,* (Rafinesque), Kyle (No. 59, pag. 79, fig. 10).

2 specimens, 15—16 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

1 specimen, 10 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

2 specimens, 10—11 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

D. 97—104, A. 77—81, lat. line abt. 60—64.

***Arnoglossus thori,*** Kyle.

1913. *Arnoglossus thori,* Kyle (No. 59, pag. 55, fig. 8).

1 specimen, 5 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

D. 87, A. 66. Second dorsal ray prolonged, 12 mm., 21.9 % of total length, and surrounded by a pigmented border.

***Lepidorhombus megastoma,*** Donovan.

4 specimens, one measured 17 cm., St. 1, 9/4, N. 49°27′, W. 8° 36′ 146 m., fine sand.

170 specimens, 7 to abt. 50 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

5 specimens, 4—11 cm., St. 96, 27/7, N. 50° 57′, W. 10° 46′, 184 m.

***Lepidorhombus boscii,*** Risso.

1832—41. *Pleuronectes boscii,* (Risso), Bonaparte (No. 5).
1862. *Arnoglossus* „ „ Günther (No. 41, IV, pag. 416).
1889. *Rhombus* „ „ „ (No. 44, pag. 418).
1896. *Lepidorhombus* „ „ Collett (No. 13 b, pag. 94).

1 specimen, 13 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

D. 82, A. 66, lat. line to caudal 85.

Total length 134 mm.

Length of body 110 mm.

Height of body 37.5 mm.

Length of head 34 mm.; proportion to total length 1 : 3.9; proportion to length of body 1 : 3.2.

Length of snout 7.5 mm.; proportion to total length 1 : 17.9.

Length of orbita 14 mm.; proportion to total length 1 : 9.6; proportion to length of head 1 : 2.4.

Length of iris 12.2 mm.; proportion to length of head 1 : 2.8.

Length of upper jaw 16 mm.

***Solea vulgaris,*** Quensel.

1 specimen, 41 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

3 specimens (not measured), St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

***Solea lutea,*** Risso.

1862. *Solea lutea,* (Risso), Günther (No. 41, IV, pag. 469).
1880—84. *Solea lutea,* (Risso), Day (No. 19, II, pag. 44, pl. CVIII, fig. 2).
1890. *Solea lutea,* (Bonaparte), Cunningham (No. 15, pag. 29, pl. VII).
1913. „ „ (Risso), Kyle (No. 59, pag. 122).

1 specimen, 7 cm., St. 36, 19/5, N. 26° 12′, W. 14° 26′.

2 specimens, 6—7 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

In all three specimens, the right pectoral fin had the same number of rays as the left, viz.: 6 in the specimen from St. 36 and the smaller of the two from St. 38, and 5 in the larger specimen from St. 38.

Besides these a specimen 58 mm. was taken from the stomach of a *Dentex vulgaris* caught on line off Cap Bojador by a Spanish fisherman.

***Solea variegata,*** Donovan.

1890. *Solea variegata,* [Fleming (Donovan)], Cunningham (No. 15, pag. 25, pl. VII).
1913. „ „ (Donovan), Kyle (No. 59, pag. 121).

3 specimens, 10—18 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

## DIVISION SCLEROPAREI.

### *Scorpænidæ.*

***Sebastes dactylopterus,*** De la Roche.

1860. *Sebastes dactylopterus,* (De la Roche), Günther (No. 41, II, pag. 99).

Abt. 10 specimens, 8—30 cm., St. 21, 5/5, N. 35° 31′, W. 6° 35′, 535 m., yellow sand.

D. XI + I 13, A. III 5.

***Scorpæna scrofa,*** Lin.

1787. *Scorpæna scrofa,* (Linné), Bloch (No. 4, ausländisch. Th., III, pag. 10, pl. 182).
1839. (1843—60). *Scorpæna scrofa,* (Linné), Lowe (No. 62, pag. 105, pl. XVI).
1860. *Scorpæna scrofa,* (Linné), Günther (No. 41, II, pag. 108).
1881. „ „ (Linné), Moreau (No. 67, II, pag. 310, fig. 116).
1919. „ „ (Linné), Roule (No. 79 c, pag. 59).

4 specimens, two of them measured 48 and 49 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

1 specimen, not measured, St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

D. XI + I 9, A. III 5, lat. line 43.

Total length 460 mm.

Height of body 130 mm.; proportion to total length 1 : 3.54.

Length of head 150 mm.; proportion to total length 1 : 3.06.

Length of snout 55 mm.; proportion to length of head 1 : 2.73.

Horiz. diam. of eye 22 mm.; proportion to length of head 1 : 6.83.

Interorbital space 26 mm.; proportion to length of head 1 : 5.77.

Length of præmaxilla 75 mm.

Length of third dorsal spine 79 mm.

Snout to anus 255 mm.

Anus to tip of caudal 240.

***Scorpæna ustulata,*** Lowe.

1860. *Scorpæna ustulata,* (Lowe), Günther (No. 41, II, pag. 110).
1891. „ „ (Lowe), Moreau (No. 67, suppl., pag. 26).
1896. „ „ (Lowe), Collett (No. 13 b, pag. 10, pl. IV fig. 15).
1906. „ „ (Lowe), Pietschmann (No 70, pag. 142).

2 specimens, 11—12 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39. m., shingle.

1 specimen, 12 cm., St. 39, 21/5, N, 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

D. XI + I 9, A. III 5, perforated scales in lat. line 24.

Total length 107 mm.

Height of body 30 mm.; proportion to total length 1 : 3.57.

Length of head 36 mm.; proportion to total length 1 : 2.97.

Length of snout 10 mm.; proportion to length of head 1 : 3.60.

Horiz. diam. of eye 11.8 mm.; proportion to length of head 1 : 3.05.

Interorbital space 6 mm.; proportion to length of head 1 : 6.00.

Total length 117 mm.

Length of head 38 mm.; proportion to total length 1 : 3.08.

Length of snout 10.5 mm.; proportion to length of head 1 : 3.62.

Horiz. diam. of eye 11 mm.; proportion to length of head 1 : 3.46.

The specimens from St. 37 have a faint dark spot behind the eye, and on the gill-cover. On the dorsal fin, there is a black spot between the 8th and 11th, or between the 9th and 10th spines. On the body, there is a suggestion of two transverse bands, not visible, however, in the ventral third; one of them is behind the head and pectoral fin below the spinous-rayed part of the dorsal, the other under the soft-rayed part of the same.

The specimen from St. 39 has no conspicuous dark spot behind the eye.

The black spot on the dorsal fin lies between the 7th and 10th spines. There is an indication of dark transverse bands, viz.; 1) behind the neck, just at the commencement of dorsal fin; 2) slightly in front of the dark spot on the dorsal fin, 3) below the soft-rayed part of the dorsal fin, and 4) on the caudal peduncle.

There are no spots on the ventral fins, but the anal has two bands of spots.

***Scorpæna cristulata,*** Goode & Bean.

1895. *Scorpæna cristulata,* Goode & Bean (No. 37, pag. 247, fig. 242).
1896. „ *echinata,* Koehler, (No. 57, pag. 478, pl. XXVII, figs. 4—6).
1906 (08). *Scorpæna cristulata,* (Goode & Bean), Holt & Byrne (No. 48, pag. 20, pl. II).

3 specimens, 38—50 cm., St. 4, 10/4, N. 49° 38′, W. 11° 35′, 923 m., sand and mud.

D. XI + I 9, A. III 5, P. 20, V. I 4.

Total length 49 cm.

Length of body 408 mm.

Height of body 132 mm.; proportion to length of body 1 : 3.10.

Height of caudal peduncle 48 mm.; proportion to length of head 1 : 3.90.

Length of head 187 mm.; proportion to length of body 1 : 2.18.

Length of snout 43 mm.

Horiz. diam. of eye 43 mm.; proportion to length of head 1 : 4.35.

Interorbital space 23 mm.; proportion to horiz. diam. of eye 1 : 1.87.

The specimen of 50 cm. is a male with genital papilla. It had a cuttlefish in the stomach presumably *Polypus vulgaris.*

## *Cottidæ.*

***Cottunculus thomsonii,*** Günther.

1887. *Cottunculus thomsonii,* Günther (No. 43, pag. 61, pl. IX, fig. B).
1888. „ *torvus,* (Goode), Vaillant (No. 86, pag. 360, pl. XXVIII, fig. 3).
1888. „ *thomsonii,* (Günther), Vaillant (No. 86, pag. 388, pl. XXVIII, fig. 3).
1895. „ *thomsonii,* (Günther), Goode & Bean (No. 37, pag. 270, figs. 258, 262).
1905 (09). „ *thomsonii,* (Günther), Collett (No. 14 b, pag. 87).

1 specimen, 33 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

D. abt. 22 rays, the first five only as points in the skin and only the 14 hindmost quite distinct.

A. 13, P. 22, V. 3 rays visible.

On left side 23 pores in lateral line included those on the caudal fin.

Total length 327 mm.

Length of body 273 mm.

Height at the nape 68 mm.; proportion to length of body 1 : 4.02.

Breadth of head 85 mm.

Length of head 97 mm.; proportion to total length 1 : 3.38, proportion to length of body 1 : 2.82.

Distance from tip of snout to the line crossing the foremargin of eyes 18.5 mm.

Horiz. diam. of eye 18.5 mm.; proportion to length of head 1 : 5.24.

Snout to ventral 81 mm.; proportion to length of body 1 : 3.37.

Snout to anus 123 mm.; proportion to total length 1 : 2.66.

Snout to anal fin 163 mm.; proportion to total length 1 : 2.01.

***Cottunculus microps,*** Collett.

1874. *Cottunculus microps,* Collett (No. 9, pag. 20, pl. I, figs. 1—3).
1880. „ „ Collett (No. 11, pag. 18, pl. I, figs. 5—6).
1887. „ „ (Collett), Günther (No. 43, pag. 60, pl. IX, fig. A).
1905 (09). *Cottunculus microps,* Collett (No. 14 b, pag. 85).

3 specimens 12.5—14.6 cm., St. 102, 9-10/8, N. 60° 57′, W. 4° 38′, 1098 m., dark sand and clay.

The occipital spines in the largest specimen are pectinate with 3 points.

## *Cyclopteridæ.*

### ***Careproctus reinhardti,*** Kr.

5 specimens, 5—11 cm., St. 102, 9-10/8, N. 60° 57′, W, 4° 38′, 1098 m., dark sand and clay.

## *Triglidæ.*

### ***Trigla pini,*** Bloch.

1793. *Trigla pini,* Bloch (No. 4, X (ausländ. VII), pag. 130, pl. 355).
1832—41. *Trigla cuculus,* (Linné), Bonaparte (No. 5).
1860. *Trigla pini,* (Bloch), Günther (No. 41. II, pag. 199).
1892. „ „ (Bloch), Smitt (No. 82, pag. 195, fig. 56).

1 specimen, 20 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

2 specimens, 24—30 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

### ***Trigla hirundo,*** Bloch.

1 specimen, 50 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

### ***Trigla gurnardus,*** Lin.

18 specimens, St. 1, 9/4, N. 49° 27′, W. 8° 36′, 146 m., fine sand.

12 specimens, 26—46 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

### ***Trigla cuculus,*** Bloch.

1783. *Trigla cuculus,* Bloch (No. 4, Deutschlands II, pag. 124, pl. 59).
1860. „ „ (Bloch), Günther (No. 41, II, pag. 207).

3 specimens, 25—32 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

### ***Trigla lyra,*** Lin.

1793. *Trigla lyra,* (Linné), Bloch (No. 4, X (ausländ. VII) pag. 111, pl. 350).
1860. *Trigla lyra,* (Linné), Günther (No. 41, II, pag. 208).

29 specimens, 13—50 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

16 specimens, one measured 35 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

1 specimen, not measured, St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

### ***Trigla obscura,*** Lin.

1829. *Trigla lucerna,* (Brünnich), Cuvier & Valenciennes (No. 18, IV, pag. 72, pl. 72).
1832—41. *Trigla obscura,* (Linné), Bonaparte (No. 5).
1860. *Trigla obscura,* (Linné), Günther (No. 41, II, pag. 210).

2 specimens, 17—18 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

### ***Lepidotrigla aspera,*** Cuv. & Val.

1829. *Trigla aspera,* Cuvier & Valenciennes (No. 18, IV, pag. 77).
1860 „ „ Cuvier (No. 17, pl. 20, fig. 1).
1860. *Lepidotrigla aspera,* (Cuvier & Valenciennes), Günther (No. 41, II, pag. 196).

20 specimens, abt. 12—14 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

Many specimens, 5 of them 10—12 cm., St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280 m., fine grey sand.

### ***Peristedion cataphractum,*** Cuv. & Val.

1 specimen, 30 cm., St. 20, 5/5, N. 35° 25′, W. 6° 25′, 141 m., fine sand.

1 specimen, St. 39, 21/5, N. 26° 3′, W. 15° 0′, 267—280, m., fine grey sand.

## DIVISION JUGULARES.

## *Trachinidæ.*

### ***Trachinus draco,*** Lin.

1 specimen, 24 cm., St. 38, 20/5, N. 26° 3′, W. 14° 36′, 77 m., red sand and shingle.

D. VI 28, A. 31.

Total length 235 mm.

Height of body 35 mm.; proportion to total length 1 : 6.73.

### ***Trachinus vipera,*** Cuv. & Val.

1860. *Trachinus vipera,* (Cuvier & Valenciennes), Günther (No. 41, II, pag. 236).

3 specimens, 9—12 cm., St. 14, 22/4, N. 41° 15′, W. 8° 54′, 69 m.

D. VI 22, A. 25.

Total length 91 mm.

Height of body 18 mm.; proportion to total length 1 : 5.05.

Total length 95 mm.

Height of body 18,2 mm.; proportion to total length 1 : 5.21.

Total length 117 mm.

Height of body 23 mm.; proportion to total length 1 : 5.09.

## *Uranoscopidæ.*

### ***Uranoscopus scaber,*** Lin.

1860. *Uranoscopus scaber,* (Linné), Cuvier (No. 17, pl. 17, fig. 1).
1860. „ „ „ Günther (No. 41, II, pag. 226).

1 specimen, 47 cm., St. 37, 20/5, N. 26° 6′, W. 14° 33′, 39 m., shingle.

## *Callionymidæ.*

***Callionymus maculatus,*** Bonap.

5 specimens, 6—9 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

## *Zoarcidæ.*

***Neobythites crassus,*** Vaillant.

Pl. VI, fig. 1.

1888. *Bythites crassus,* Vaillant (No. 86, pp. 279, 387, pl. XXV, fig. 1).
1895. *Neobythites crassus,* (Vaillant), Goode & Bean (No. 37, pag. 327).

1 specimen, 55 cm., St. 25, 8/5, N. 35° 46′, W. 8° 16′, 2055 m., yellow mud.

1 specimen, 36 cm., St. 88, 18/7, N. 45° 26′, W. 25° 45′, 3120 m., sand and yellow mud.

11 specimens, 41—48 cm., St. 95, 26-27/7, N. 50° 22′, W. 11° 44′, 1797 m.

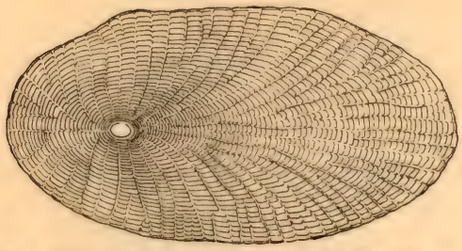


Fig. 51. *Neobythites crassus,* Vaill., 55 cm. Scale (× 15).

The fish answers to VAILLANT's description, save in the following points:

The præoperculum is entirely covered by the skin, so that it does not present any appearance of dentition. The caudal is, in all the present specimens, distinct, but continuous with the dorsal and anal.

On the head, which is otherwise entirely scale-covered, the lips, the walls of the cleft from the nostrils to the upper jaw, and part of the membrane covering the branchiostegal rays are naked.

The lateral line is only distinctly apparent parallel with the back from the upper point of the gill aperture to the dorsal fin.

***Mixonus laticeps,*** Günther.

1887. *Mixonus laticeps,* Günther (No. 43, pag. 108, pl. XXV, fig. B).
1888. *Sirembo guentheri,* Vaillant (No. 86, pag. 268, pl. XXIV, fig. 5).
1888. *Mixonus (Bathynectes) laticeps,* (Günther), Vaillant (No. 86, pag. 386).

1 specimen, 13 cm., St. 53, 8/6, N. 34° 59′, W. 33° 1′, 2615 m., yellow hard clayish mud.

Total length 127 mm.
Length of body 126 mm.
Height of body 18 mm.; proportion to length of body 1 : 7.00.
Breadth of body 8 mm.; proportion to length of body 1 : 15.7.
Ventral to anus 31 mm.
Length of head 24 mm.; proportion to length of body 1 : 5.25.

*Neobythites crassus,* Vaillant.

| Total length | Height of body | Breadth of body | Length of head | Length of snout | Length of eye | Inter-orbital space | Tip of snout to anus | Length of pectoral | Length of inner ventral ray | Length of outer-most ventral ray | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 363 mm..... | 71 | 34 | 72 | 19 | 10 | 22 | 141 | 37 | 42 | 26 | 88 |
| 46 cm. ..... | 102 | 45 | 83 | 24 | 12.5 | 31 | 194 | 48 | 51 | 26 | 95 |
| 547 mm. ..... | 115 | 53 | 89 | 26.5 | 13.5 | 33.5 | 219 | abt. 48 | abt. 54 | abt. 33 | 25 |

| Total length | Total length: Height of body | Total length: Breadth of body | Total length: Length of head | Length of head: Length of eye | Length of snout: Length of eye | Length of head: Interorbital space | Station |
|---|---|---|---|---|---|---|---|
| 363 mm. ..... | 5.12 | 10.7 | 5.05 | 7.2 | 1.9 | 3.27 | 88 |
| 46 cm. ..... | 4.51 | 10.2 | 5.54 | 6.64 | 1.92 | 2.68 | 95 |
| 547 mm. ..... | 4.75 | 10.3 | 6.15 | 6.59 | 1.96 | 2.66 | 25 |

Length of snout 6.3 mm.; proportion to length of head 1 : 3.81.

Length of eye 3 mm.; proportion to length of head 1 : 8.00, proportion to interorbital space 1 : 2.84.

Interorbital space 8.5 mm.; proportion to length of head 1 : 2.82.

Pectoral 18 rays.

Ventral 2 rays.

***Dicrolene intronigra,*** Goode & Bean.

1887. *Dicrolene intronigra*, (Goode & Bean), Günther (No. 43, pag. 107).
1888. „ *introniger*, (Goode & Bean), Vaillant (No. 86, pag. 258, pl. XXIII, fig. 2).
1895. „ *intronigra*, Goode & Bean (No. 37, pag. 338, fig. 297).
1899. „ „ (Goode & Bean), Alcock (No. 1 a, pag. 85).

1 specimen, 13 cm., St. 48, 31/5, N. 28° 54′, W. 24° 14′, about 5000 m.

This fish answers to the previous descriptions. Unfortunately it is in a bad state of preservation, and the measurements given below are consequently not absolutely accurate.

Total length 134 mm.

Length of body 121 mm.

Height at the nape 16 mm.; proportion to length of body 1 : 7.57.

Height of body 13 mm.; proportion to length of body 1 : 9.31.

Length of head 24 mm.; proportion to length of body 1 : 5.04.

Length of eye 6 mm.

Interorbital space 6 mm.

Tip of snout to dorsal 29 mm.

Tip of snout to anus 46.5 mm.

Length of longest pectoral ray 36 mm.; proportion to length of body 1 : 3.36.

Pectoral 18 + 8 rays.

Ventral 2 rays.

Caudal 7 rays.

***Lycodes terræ novæ,*** Collett.

Pl. II, fig. 3.

1896. *Lycodes terræ novæ*, Collett (No. 13 b, pag, 54).
1904. „ „ „ (Collett), Jensen (No. 50 b, pag. 27, note).

12 specimens, 4.5—11.2 cm., St. 70, 30/6, N. 42° 59′, W. 51° 15′, 1100 m.

The variation in percentage of the total length is for the height of body 6.9—9.8, for the distance between the tip of the snout and the anus 32.2—36.2 and for the length of the head 20.0—22.8.

| Total length | Height of body | Length of head | Tip of snout to anus | Anus to tip of tail |
|---|---|---|---|---|
| mm. | | | | |
| 45 | 3.8 | 10 | 14.5 | 30 |
| 48 | 4 | 10.9 | 16 | 32 |
| 53 | 4.2 | 11 | 17.5 | 35 |
| 54 | 5 | 12 | 18 | 35 |
| 57 | 4.8 | 13 | 19.8 | 35.7 |
| 61 | 5.1 | 13 | 22 | 39 |
| 63 | 4.8 | 13 | 21.7 | 41 |
| 65 | 5.1 | 14 | 23 | 41.5 |
| 66 | 5.5 | 14.3 | 23 | 41 |
| 72 | 6 | 15 | 26 | 45 |
| 90 | 6.2 | 18 | 29 | 58 |
| 112 | 11 | 23 | 40 | 69 |

| Total length | Total length: Height of body | Total length: Length of head | Total length: Tip of snout to anus | Anus to tip of tail: Tip of snout to anus |
|---|---|---|---|---|
| mm. | | | | |
| 45 | 11.83 | 4.5 | 3.1 | 2.07 |
| 48 | 12.0 | 4.41 | 3.0 | 2.0 |
| 53 | 12.62 | 4.82 | 3.03 | 2.0 |
| 54 | 10.8 | 4.5 | 3.0 | 1.95 |
| 57 | 11.88 | 4 38 | 2.88 | 1.79 |
| 61 | 11.95 | 4.69 | 2.78 | 1.77 |
| 63 | 13.1 | 4.84 | 2.90 | 1.89 |
| 65 | 12.73 | 4.64 | 2.82 | 1.80 |
| 66 | 12.0 | 4.61 | 2.87 | 1.75 |
| 72 | 12.0 | 4.8 | 2.77 | 1.73 |
| 90 | 14.5 | 5.0 | 3.10 | 2.0 |
| 112 | 10.2 | 4.87 | 2.80 | 1.73 |

| Total length | Height of body in percentage of total length | Length of head in percentage of total length | Tip of snout to anus in percentage of total length |
|---|---|---|---|
| mm. | | | |
| 45 | 8.44 | 22.2 | 32.2 |
| 48 | 8.34 | 22.7 | 33.3 |
| 53 | 7.93 | 20.8 | 33.0 |
| 54 | 9.26 | 22.2 | 33.4 |
| 57 | 8.43 | 22.8 | 34.8 |
| 61 | 8.37 | 21.3 | 36.1 |
| 63 | 7.62 | 20.6 | 34.5 |
| 65 | 7.85 | 21.6 | 35.4 |
| 66 | 8.34 | 21.7 | 34.9 |
| 72 | 8.34 | 20.8 | 36.2 |
| 90 | 6.9 | 20.0 | 32.2 |
| 112 | 9.8 | 20.5 | 35.7 |

The upper jaw extends to the anterior margin of the pupil. The series of palatine teeth is very short; as far as I was able to discern with the lens, there are five teeth on the vomer and three on each palatine. The pectoral fin has 22—23 rays; the 6 lowest are thicker

than those above, and have their points free. On the largest two the scales cover the body before the anus and the bases of the median fins and of the pectoral fins; on the other hand the scales are not yet fully developed on the tail; they are fairly large; close on thirty can be counted from the anus to the dorsal fin.

The lateral line is double, ventral and dorsal.

### *Lycodes lütkenii,* Collett.

1880. *Lycodes lütkenii,* Collett (No. 11, pag. 103, pl. III, fig. 25).
1904. „ „ ( „ ), Jensen, (No. 50 b, pag. 59).

1 specimen, 49 cm., St. 102, 9-10/8, N. 60° 57′, W. 4° 98′, 1098 m., dark sand and clay.

Total length 49 cm.

Height of body at anus 68 mm., 13.9 % of total length; proportion to total length 1 : 7.21.

Height of body at origin of dorsal 84 mm.; proportion to total length 1 : 5.83.

Distance between tip of snout and dorsal 135 mm.; 27.6 % of total length; proportion to total length 1 : 3.63.

Distance between tip of snout and anus 233 mm., 47.5 % of total length; proportion to total length 1 : 2.10.

Distance between anus and tip of tail 261 mm.; proportion to total length 1 : 1.88.

Length of head 122 mm., 24.9 % of total length; proportion to total length 1 : 4.01.

Length of snout 44 mm.

Horizontal diam. of orbit 15 mm., 3.06 % of total length; proportion to length of head 1 : 8.14.

Horizontal diam. of iris 12 mm., 2.45 % of total length; proportion to length of head 1 : 10.2.

Distance between irides 22 mm.; proportion to length of head 1 : 5.55.

The proportions between length of eye and head and between interorbital space and head are somewhat different from those given by COLLETT. He indicates in the text (No. 11, pag. 107) the proportion between the length of the eye and the length of the head as 1 : 9.5, but after his measurements the proportion between horizontal diameter of iris and length of head is 1 : 7.31, and after these too the proportion between the distance between the irides and the length of head is 7.92. The specimen described by COLLETT is, however, a female, that here recorded a male.

Length of upper jaw 48 mm.

The upper jaw reaches below the centre of iris. In the præmaxilla are 20 teeth, and behind the foremost of these a short series of 4 teeth; on the vomer 5 teeth, on the palatine 13 or 14, on the mandible 19 and besides these in front outside the series a group of small teeth.

Postorbital part of head 70 mm. The flap of the gill-cover is not bent upwards.

Height of head at eyes 44 mm.

Height of head just behind ventrals 71 mm.

Distance from ventrals to anus 139 mm.

Distance from pectoral to anus 125 mm.

Base of pectoral 38 mm.

Length of pectoral 81 mm., 16.5 % of total length; proportion to total length 1 : 6.05.

The pectoral has 23 rays. The lateral line is mediolateral and curved up an down over the pectoral, dorsally of this a series of pores reaches at any rate to the hindmost third of the fish. The scales extend so far forward as the dorsal, only a small triangle under the foremost rays is naked, while the belly before anus is naked. The colour is not distinct now, but 5 pale bands are seen in the dorsal and down the sides partly as ocelli.

### *Lycodes pallidus,* Collett.

1904. *Lycodes pallidus,* (Collett), Jensen (No. 50 b, pag. 38, pl. IV).

8 specimens, 9—20 cm., St. 102, 9-10/8, N. 60° 57′, W. 4° 38′, 1098 m., dark clay.

As will be seen from the dimensions and percentages given below, these specimens do not altogether agree with JENSEN's statements.

The height of body is, in the smallest but one, lower, in three other specimens higher, and in these three agrees more with *var. similis* (No. 50 b, pag. 39). The eyes in the three smallest also correspond to JENSEN's notes for *similis*.

The distance from tip of snout to anus is in the two specimens of 117 and 146 mm. shorter than otherwise in *L. pallidus*, and the same is the case with all of them as regards the distance from tip of snout to dorsal fin.

| Total length | Height of body at anus | Tip of snout to anus | Tip of snout to dorsal | Length of head | Length of eye | Length of snout | Number of rays in pectoral fin | Number of scales between dorsal and anus |
|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | |
| 93 | 8.5 | 36.5 | 25 | 22 | 5.1 | 6.8 | 19 | — |
| 117 | 10 | 42 | 30 | 25 | 6 | 7.8 | 20 | abt. 20 |
| 146 | 13.2 | 51.5 | 34 | 31.8 | 7 | 10 | 20 | „ 20 |
| 185 | 20.8 | 70 | 47.5 | 39 | 7 | 14 | 20 | „ 18 |
| 189 | 19 | 72.5 | 48 | 44 | 8.2 | 14 | 20 | „ 16 |
| 195 | 22 | 78.2 | 54.5 | 47 | 8.2 | 15 | 19 | — |
| 196 | 22.2 | 75 | 52 | 44 | 7.5 | 15 | 20 | „ 20 |
| 203 | 21 | 77 | 54.5 | 47 | 8.2 | 16 | 19 | „ 18 |

| Total length | Height of body in percentage of total length | Tip of snout to anus in percentage of total length | Tip of snout to dorsal in percentage of total length | Length of head in percentage of total length | Length of eye in percentage of total length | Length of snout in percentage of total length |
|---|---|---|---|---|---|---|
| mm. | | | | | | |
| 93 | 9.15 | 39.2 | 26.9 | 23.7 | 5.5 | 7.32 |
| 117 | 8.55 | 35.9 | 25.6 | 21.4 | 5.13 | 6.66 |
| 146 | 9.05 | 35.3 | 23.3 | 21.8 | 4.8 | 6.85 |
| 185 | 11.2 | 37.8 | 25.7 | 21.1 | 3.8 | 7.57 |
| 189 | 10.1 | 38.4 | 25.4 | 23.3 | 4.34 | 7.42 |
| 195 | 11.3 | 40.1 | 28 | 24.1 | 4.2 | 7.7 |
| 196 | 11.3 | 38.3 | 26.5 | 22.4 | 3.83 | 7.66 |
| 203 | 10.3 | 37.9 | 26.9 | 23.2 | 4.04 | 7.9 |

The length of the ventral fins is abt. 3/4 that of the eye. The ventral lateral line is distinct, but no mediolateral is visible. On the smallest specimen but one, a dorsal lateral line is faintly discernible.

The two specimens of 189 and 203 mm. are quite pale, with insignificant dark shading on the dorsal fin. On the others the colour is brownish, the head behind the eyes dark, basis of pectorals and belly just behind the ventrals violet; otherwise, the belly is greyish. The dorsal appears to have had a couple of dark stripes in the anterior portion.

### *Lycenchelys muræna*, Collett.

1904. *Lycenchelys muræna*, (Collett), Jensen (No. 50 b, pag. 82, figs. 15—19).

9 specimens, 7—17 cm., St. 102, 9-10/8, N. 60° 57′, W. 4° 38′, 1098 m., dark sand and clay.

| Total length | Tip of snout to anus | Tip of snout to dorsal | Height of body at anus | Height of body at foremost part of anal | Breadth of body at foremost part of anal | Length of head | Length of eye | Breadth of head | Number of grooves along upper jaw | Number of branchiostegal rays | Number of pectoral rays |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | |
| 74 | 21 | 13 | 3.2 | 3.1 | 1.8 | 10.7 | 2 | 4 | 7 | 6 | 15 |
| 91 | 25.5 | 17 | 4 | 3.5 | 2.5 | 13 | 2.8 | — | 7 | — | 15 |
| 92 | 25.5 | 16 | 4.5 | 4 | 2.7 | 12.2 | 3 | — | 7 | 6 | 15 |
| 93 | 25 | 15.5 | 4.5 | 3.8 | 2.5 | 12.5 | 2.7 | — | 7 | — | 15 |
| 152 | 44.5 | 28.2 | 8.5 | 6.8 | 4.2 | 22.5 | 4.5 | — | — | 6 | 15 |
| 154 | 44 | 26 | 8.8 | 7.5 | 5 | 23.9 | 4 | — | 7 | 6 | 16 |
| 159 | 47 | 30 | 8 | 7 | 4.5 | 24.2 | 5.5 | — | — | 6 | 14 |
| 165 | 46 | 30 | 9 | 8 | 5 | 24 | 4.8 | — | 7 | 6 | 15 |
| 167 | 49 | 33 | 9 | 7.2 | 4 | 26 | 4.5 | — | 7 | — | 15 |

| Total length | Tip of snout to anus in % of total length | Tip of snout to dorsal in % of total length | Height of body at anus in % of total length | Length of head in % of total length | Length of eye in % of total length | Total length: Height of body at anus | Height of body at anal: Breadth of body at anal | Length of head: Breadth of head |
|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | |
| 74 | 28.4 | 17.6 | 4.32 | 14.5 | 2.71 | 23.1 | 1.72 | 2.68 |
| 91 | 28 | 18.7 | 4.4 | 14.3 | 3.08 | 22.7 | 1.40 | — |
| 92 | 27.8 | 17.4 | 4.9 | 13.3 | 3.26 | 20.4 | 1.48 | — |
| 93 | 26.9 | 16.7 | 4 84 | 13.5 | 2.91 | 20.6 | 1.52 | — |
| 152 | 29.3 | 18.6 | 5.6 | 14.8 | 2.96 | 17.9 | 1.62 | — |
| 154 | 28.6 | 16.9 | 5.71 | 15.5 | 2.6 | 17.5 | 1.5 | — |
| 159 | 29.6 | 18.9 | 5.04 | 15.2 | 3.46 | 19.9 | 1.56 | — |
| 165 | 27.9 | 18.2 | 5.45 | 14.5 | 2.91 | 18.3 | 1.6 | — |
| 167 | 29.4 | 19.8 | 5.39 | 15.6 | 2.7 | 18.6 | 1.8 | — |

Length of head 13.3 to 15.6 % of total length, and only in two specimens under 14 %; the highest value noted by JENSEN is 13.3 % (No. 50 b, pag. 83). Breadth of head goes 2 2/3 times into its length in the specimen of 74 mm. The mandible closely embraced by the upper jaw. The tail compressed; proportion between its thickness and the height a little behind the anus is as 1 : 1.4—1.8. In the smallest specimen, 74 mm. long, there are already scales on the sides in front of the anus.

Colour, as far as anything can now be said with regard to this, uniformly brownish, lighter ventrally. The belly is bluish-grey from the peritoneum.

### *Lycodonus flagellicauda*, Jensen.

1904. *Lycodonus flagellicauda*, Jensen (No. 50 b, pag. 94, figs. 29—33).

2 specimens, 7—8 cm., St. 102, 9-10/8, N. 60° 57′, W, 4° 38′, 1098 m., dark sand and clay.

| Total length | Tip of snout to anus | Tip of snout to dorsal | Height of body at anus | Height of body at foremost part of anal | Breadth of body at foremost part of anal | Length of head | Length of eye | Breadth of head | Number of grooves along upper jaw | Number of branchiostegal rays | Number of pectoral rays |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | | | | |
| 68 | 19.5 | 15 | 3 | 2 | 1.8 | 10.5 | 2 | 5 | — | 5 | 15 |
| 84 | 24 | 18 | 3.2 | 2.5 | 2 | 13.8 | 2 | 6 | 8 | 5 | 14 |

| Total length | Tip of snout to anus in % of total length | Tip of snout to dorsal in % of total length | Height of body at anus in % of total length | Length of head in % of total length | Length of eye in % of total length | Total length: Height of body at anus | Height of body at anal: Breadth of body at anal | Length of head: Breadth of head |
|---|---|---|---|---|---|---|---|---|
| mm. | | | | | | | | |
| 68 | 28.7 | 22.1 | 4.41 | 15 5 | 2.95 | 22.6 | 1.1 | 2.10 |
| 84 | 28.6 | 21.4 | 3.82 | 16.4 | 2.38 | 26.2 | 1.25 | 2.30 |

JENSEN gives length of head as 12.7—14.5 % of total length; in these two, as we see, it is considerably in excess of this. Breadth of head goes $2^{1}/_{10}$ to $2^{3}/_{10}$ times into length of same. The eyes are set close together, and turn obliquely upward. The tail behind the anus only slightly narrower than high. The five lowest pectoral rays are thick, and have their points free. No scales on either of the two specimens.

### *Lycodonus mirabilis*, Goode & Bean.

Pl. V, fig. 6.

1895. *Lycodonus mirabilis*, Goode & Bean (No. 37, pag. 312, fig. 280).
1904. „ „ (Goode & Bean), Jensen (No. 50 b, pag. 93).

1 specimen, 7 cm., St. 70, 30/6, N. 42° 59′, W. 51° 15′, 1100 m.

| | mm. |
|---|---|
| Total length | 69 |
| Tip of snout to anus | 18 |
| Tip of snout to dorsal | 10.5 |
| Height of body at origin of dorsal | 3.5 |
| Height of body at anus | 2.5 |
| Height of body at foremost part of anal | 2 |
| Breadth of body at foremost part of anal | 1.5 |
| Length of head | 10 |
| Length of eye | 2.8 |
| Breadth of head | 4 |
| Number of grooves along upper jaw | 8 |
| Number of radii branchiostegi | 5 |
| Number of pectoral rays | 18 |
| Tip of snout to anus in % of total length | 26.1 |
| Tip of snout to dorsal in % of total length | 15.2 |
| Height of body at anus in % of total length | 3.63 |
| Length of head in % of total length | 14.5 |
| Length of eye in % of total length | 4.06 |
| Total length: Height of body at origin of dorsal | 19.7 |
| Total length: Height of body at anus | 27.6 |
| Height of body at anal: Breadth of body at anal | 1.33 |
| Length of head: Breadth of head | 2.50 |

The dorsal has no rays on the eight anterior interspinals.

All rays in the pectoral fins are slender.

### *Catætyx laticeps* n. sp.

Pl. VI, fig. 3.

1 specimen, 29 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

Body compressed, but head flattened, broader than high.

Height of body at commencement of dorsal fin $^{1}/_{6}$ length of body; $^{1}/_{3}$ the distance from snout to anus, and a little smaller than $^{2}/_{3}$ length of head. Head goes $3^{4}/_{5}$ times into length of body. Proportion between height of head and breadth of same is at the posterior margin of the præoperculum as 1 : 1.06; at middle of pupil as 1 : 1.35. Snout blunt, rounded. Eyes oval, situate on upper side of head, turned obliquely upwards and slanting also in towards the tip of snout so that their longitudinal diameters, produced beyond the snout, would intersect in an acute angle. The interval between the eyes is flat, the neck slightly domed from side to side. The interorbital space slightly more than the longitudinal ocular diameter, the snout $1^{1}/_{2}$ times the latter, which is itself about $^{1}/_{7}$ the length of head. Postorbital portion of the head long, going $1^{1}/_{2}$ times into whole head. The upper jaw is formed entirely of the præmaxilla, and has in front, at the symphysis, a notch cut upward to receive the mandible. The cleft of the mouth extends to the posterior margin of the eye; the maxilla reaches farther back; it is expanded at the rear, its breadth being equal to the length of eye. The lower posterior corner forms a right angle, the upper an acute.

Teeth in villiform bands on præmaxillaries, mandible, vomer and palatines. The præoperculum is evenly rounded, the lower portion of the operculum, likewise, but the upper part of the latter is drawn out into a point, above the base of the pectoral fin, and here the point of the opercular spine thrusts out. The rest of the spine is entirely covered by the skin; its entire length is equal to the snout. There are 9 branchiostegal rays.

The entrance to the foremost nostril is formed as a tube; it is situated laterally on the anterior margin of the snout. Beneath it are four papillæ, and medially to it is a canal also overlapping four papillæ. The tube of the foremost nostril leads to an opening, the posterior nostril, midway between the foremost and the eye. Exactly late-

rally to the foremost nostril is an aperture, likewise furnished with a papilla; this leads to an infraorbital canal, which bears, externally at any rate, small white papillæ. At certain intervals it opens ventrally into slit-like pores; there is also a pore behind, in front of the hyomandibular arch. Its lower margin covers a furrow between it and the maxilla. The posterior margin of the præoperculum covers a similar furrow, and along the curve of the preopercle itself is a canal with large slit-like pores which continue out on the mandible; like the infraorbital, it is furnished with small papillæ. In addition, a row of similar papillæ runs from a little above the foremost nostril beyond the posterior, past the eye, and further on along the upper margin of the operculum. Medially to this, there is a direct continuation of the lateral line out over the crown; this gives off a transverse branch over the neck to the corresponding line on the other side.

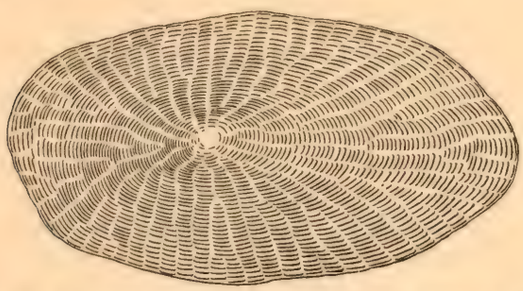


Fig. 52. *Catætyx laticeps*, n. sp., 29 cm. Scale (× 25).

The lateral line can be followed rearward from the upper angle of the gill opening a little way under the dorsal fin; thereafter it continues down the side in the median line to the point of the tail.

Just behind the head is the fleshy base of the pectoral fin, and straight above it, between it and the point of the opercular spine, there is a strong spine hidden in a flap of skin. The pectoral fin has 28 slender rays; it is shorter than the postorbital portion of the head, and reaches out under the dorsal fin to about midway between the head and the anal fin. The ventral fins are situate close together in the median line behind the humeral symphysis. They consist each of but one filament, but in their basal parts have the appearance of being composed of two rays. They reach about to beneath the middle of the pectoral fin. The distance from their base to the anus is greater than the length of head. The dorsal fin commences above the middle point in the distance from humeral symphysis to anus. The anus is at the middle of the body. Behind the anus is a genital appendix, resembling that described by GARMAN in *Catætyx simus* (No. 26, pag. 168, pl. XXXIX, figs. 3—6). Behind this, the anal fin begins; it is continuous with the caudal fin, which is likewise connected with the dorsal.

The entire body is covered with small scales, as also the head with exception of the snout, lower side of head, posterior margin of opercle and preopercle, præmaxilla and at any rate part of the maxilla. The scales are rather egg-shaped, the core lying slightly in front of the centre; they have concentric rings in four zones, and radial furrows (fig. 52).

The colour appears to have been brown, the fins and membranous parts nearly black.

Total length 29 cm.

Length of body 260 mm.

Height of body 44 mm.; proportion to length of body 1 : 5.91; proportion to tip of snout to anus 1 : 2.96; proportion to length of head 1 : 1.54.

Tip of snout to anus 130 mm.; proportion to total length 1 : 2.23.

Anus to caudal 134 mm.

Length of head 68 mm.; proportion to length of body 1 : 3.83.

Breadth of head at hindmargin of preopercle 35 mm.

Height of head „ „ „ „ 33 „ ; proportion to breadth 1 : 1.06.

Breadth of head at eyepupils 31 mm.

Height „ „ „ „ 23 mm.; proportion to breadth 1 : 1.35.

Length of snout 14 mm.

Length of eye 10 mm.

Interorbital space at eyepupils 12 mm.

Postorbital part of head 45 mm.; proportion to length of head 1 : 1.51.

Length of pectoral 37 mm.

Tip of snout to pectoral 68 mm.

Length of ventral 24 mm.

Base of ventral to anus 76 mm.

Tip of snout to dorsal 94 mm.

Radii branchiostegi 9, P. 28 rays, V. 1 or 2.

### ***Monomitopus torvus,*** Garman.

Pl. VI, fig. 4.

1899. *Monomitopus torvus,* Garman (No. 26, pag. 157, pl. XL, fig. 1)

2 specimens, 21—23 cm., St. 41, 23/5, N. 28° 8′, W. 13° 35′, 1365 m., yellow mud.

Height of body goes $5^2/_3$ to $5^3/_4$ times into length of body, and is about $^4/_5$ the length of head. Length of snout $^1/_4$ that of head; the snout slopes slightly down from the frontals, and is domed out sligthly over the upper lip. The anterior nostril is about equidistant from tip of snout and eye, posterior about equidistant from anterior and from eye. The groove from anterior

| Total length | Length of body | Height of body | Length of head | Length of snout | Length of eye | Interorbital space | Tip of snout to anus | Tip of snout to anal fin | Length of pectoral | Length of ventral | Ventral to anus | Radii branchiostegi | Pectoral rays | Ventral ray |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 212 mm. | 194 | 34 | 40 | 10 | 8.8 | 12.8 | 71 | — | 21 | — | — | — | abt. 30 | 1 |
| 23 cm. | 215 | 38 | 46 | 11.5 | 9 | 14.5 | 81 | 85 | 24 | 28 | 44 | 8 | „ 30 | 1 |

| Total length | Length of body: Height of body | Length of head: Height of body | Length of body: Length of head | Length of head: Length of snout | Length of head: Length of eye | Length of snout: Length of eye | Interorbital space: Length of eye | Length of body: Tip of snout to anus |
|---|---|---|---|---|---|---|---|---|
| 212 mm. | 5.71 | 1.18 | 4.85 | 4.00 | 4.55 | 1.14 | 1.46 | 2.74 |
| 23 cm. | 5.66 | 1.21 | 4.68 | 4.00 | 5.11 | 1.28 | 1.61 | 2.66 |

nostril to the lip is very slight or obsolete. Length of eye about $4^1/_2$—5 times in the head, and is about $^4/_5$ the length of snout, $^2/_3$ of the interorbital space. The mouth opening is entirely bounded on the upper side by the præmaxilla.

The maxilla extends out to behind the eye; it is expanded at the rear, and the suborbital falls with a free edge over its upper margin. Teeth in villiform bands on præmaxillæ, mandible, palatina and vomer. On the vomer, the teeth are very small laterally, but stronger on its head. The opercular spine is strong, but not reaching the hind margin of the opercle. At the corner of the preopercle there is a serrated part with three teeth. Branchiostegal rays 8.

Fig. 53. *Monomitopus torvus*, Garman. 21 cm. Scale (× 25).

The pectoral fin is situate immediately behind the head. Its base is scale-covered. Length about half that of head, rays about 30. The ventrals are single-rayed and filamentous. They are situate close together behind the humeral symphysis, and reach nearly below the last third of the pectoral fin. The dorsal fin commences above the fore half of the pectoral fin, and the anal under the 20th ray of the dorsal. They are continuous with the long caudal fin. Distance from tip of snout to anus goes $2^2/_3$ to $2^3/_4$ times into length of body.

The lateral line distinct. Its extends from the gill aperture out along the side about midway between the median line of the same and the back, until it reaches the last two-thirds of the tail,where it runs close under the back. The head as well as the body covered with small scales (fig. 53).

Colour has been brownish grey with a bluish-black tinge on the median fins, the belly and head, most marked on the jaws, the opercle and the branchiostegal membrane.

### **Oculospinus**, n. g.

Related to *Monomitopus* (No. 26, pag. 156), but the præoperculum lacks spines, while on the other hand there is a spine between the posterior nostril and the eye.

The pectoral fins have a broad base, and long rays, all with the points free. The ventral fins are situate close together, medially, just behind the humeral symphysis; they consist each of but a single ray.

#### ***Oculospinus brevis***, n. sp.

Pl. VI, fig. 5.

1 specimen, 11 cm., St. 23, 6/5, N. 35° 32′, W. 7° 7′, 1215 m., yellow mud.

The body fairly even in height from neck to anus, tail drawn out to a slender point, but decreases only slightly in height, the height at middle of tail being about half the maximal height of body, and in proportion to height at anus as 1 : 1.6. The dorsal and ventral edges of the tail meet at the point in an angle of about 15°. Breadth of the body behind the pectoral fins goes only about $1^1/_2$ times into the height; the tail, however, is considerably more compressed, the breadth at middle of tail going $2^1/_2$ times into the height there.

The head goes hardly $3^1/_2$ times into the length of body. Snout blunt, and going $4^2/_3$ times into length of head. The eye is somewhat smaller, going 5.4 times into the length of head; it is oval, and its vertical diameter is equal to the interorbital frontal breadth.

The maxilla terminates a little behind the eye. The upper jaw is formed by the præmaxilla, which is well furnished with a cardiform armament of minute teeth; in front, the dentition of the mandible is likewise cardi-

form, but laterally, it has a single row of stronger teeth. Vomer and palatina have a few rows of teeth; they are largest on the palatina.

The foremost nostril is right at the front of the snout, the hinder one just before the eye, separated from it by a recurved, rearward pointing spine; otherwise, the head has only one spine on the upper posterior corner of the operculum, the præoperculum being evenly rounded.

The infraorbital, which falls down over the maxilla, supports a mucous canal. The canals on the head appear as series of grooves or as furrows: —

From the mandible over the preopercle to the upper corner of the operculum; from the snout under and behind the eye; and from the snout over the eye to the neck.

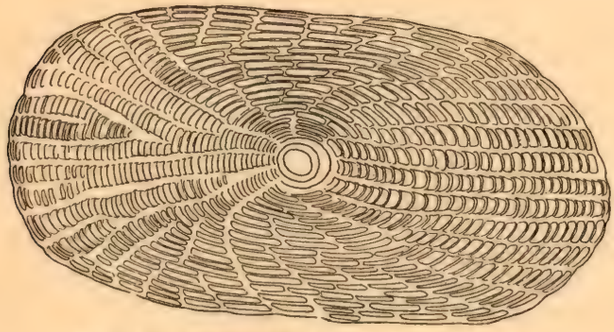


Fig. 54. *Oculospinus brevis,* n. sp., 11 cm. Scale over pectoral (× 50).

From the neck, the lateral line continues in a row of dark pores out under the back a short distance under the commencement of the dorsal fin, whence it runs down to the median line. The dorsal fin commences at the second third of the body, and the anal close behind the anus, which is situate at the middle of the body; both run continuous with the caudal fin; all three fins have long thin articulate rays.

The pectoral fins are set immediately behind the head below the middle of the body; they have a broad base, and 31 thin rays, all with ends free; the length is slightly more than the postorbital portion of head. The ventral fins are set close together behind the humeral symphysis and in front of the pectoral fins; they consist each of but one thin ray, which is almost as long as the head.

Both head and body, as also the bases of the pectoral and median fins, are covered with small scales of the same type as in *Monomitopus* (fig. 54).

Colour now yellowish-grey, darkest on the back, where is has presumably been brown; the operculum, and particularly the belly, where the peritoneum shows through, are bluish.

Total length 112 mm.
Length of body 101 mm.
Height of body at the nape 17 mm.
„ behind base of pectoral 19 mm.; proportion to length of body 1 : 5.32.
Height at anus 16 mm.
„ in the middle of tail 10 mm.
Breadth of body behind base of pectoral 12 mm.; proportion to height behind base of pectoral 1 : 1.58.
Breadth in the middle of the tail 4 mm.; proportion to height in middle of tail 1 : 2.50.
Length of head 28 mm.; proportion to length of body 1 : 3.61.
Length of snout 6 mm.; proportion to length of head 1 : 4.67.
Length of eye 5.2 mm.; proportion to length of head 1 : 5.39.
Vertical diam. of eye 4 mm.; proportion to length of eye 1 : 1.30.
Interorbital space 4 mm.
Length of postorbital part of head 17 mm.; proportion to length of head 1 : 1.65.
Distance from tip of snout to dorsal fin 35 mm.; proportion to length of body 1 : 2.89.
Distance from tip of snout to anus 50 mm.
Length of pectoral fin about 20 mm.
Length of ventral fin about 25 mm.
Number of rays in pectoral fin 31.
Number of rays in ventral fin 1.
Number of branchiostegal rays 8.

***Holcomycteronus digittatus,*** Garman.
Pl. VI, fig. 2.

1899. *Holcomycteronus digittatus,* Garman (No. 26, pag. 163, pl. XXXVI, fig. 1; pl. LXXVI, fig. 2).

1 specimen, 31 cm., St. 35, 18/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

As the present specimen answers to GARMAN's description it will here suffice to give some measurements, with a drawing of the fish and of a scale.

Total length 31 cm.
Height of body 55 mm.; proportion to total length 1 : 5.64.
Snout to anal 127 mm.
Length of head 55 mm.; proportion to total length 1 : 5.64, proportion to snout to anal 1 : 2.31.
Length of snout 15 mm.
Interorbital space 19 mm.
Length of eye 7.5 mm.; proportion to length of snout 1 : 2.00, proportion to interorbital space 1 : 2.54.

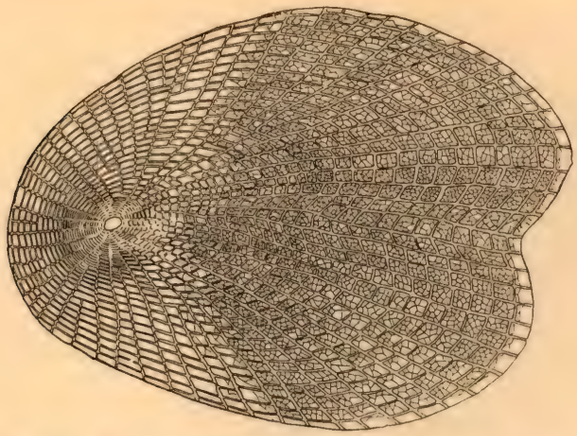


Fig. 55. *Holcomycteronus digittatus,* Garman, 31 cm. Scale (× 15).

Number of pectoral rays 20.
Number of branchiostegal rays 8.

***Acanthonus armatus,*** Günther.

1887. *Acanthonus armatus,* Günther (No. 43, pag. 117, pl. XXIV, fig. A).

1 specimen, 35 cm., St. 35, 18-19/5, N. 27° 27′, W. 14° 52′, 2603 m., yellow mud.

This specimen answers so well to GÜNTHER's description that further details are unnecessary.

Total length 35 cm.

Length of body 34 cm.

Length of head without spines 85 mm.; proportion to length of body 1 : 4.00, proportion to distance from head to caudal 1 : 2.94.

Length of snout without spines about 30 mm.; proportion to length of head 1 : 2.84.

Length of eye about 10 mm.

Interorbital space 40 mm.

Opercular spine from the base 36 mm.; proportion to length of head 1 : 2.36.

Free portion of opercular spine 21 mm.

From head to base of caudal 250 mm.

Tip of snout to anus 110 mm.; proportion to length of body 1 : 3.09.

Ventral to anus 65 mm.

Length of ventral 33 mm.

Pectoral fin 17 rays.

Anus below hindmost part of pectoral.

Ventrals placed just below end of maxilla.

## SUBORDER PEDICULATI.

### *Lophiidæ.*

***Lophius piscatorius,*** Lin.

4 specimens. 25—135 cm., St. 3, 10/4, N. 49° 32′, W. 10° 49′, 184 m., fine sand.

### *Malthidæ.*

***Dibranchus atlanticus,*** Peters.

Pl. V, figs. 4 & 5.

1875. *Dibranchus atlanticus,* Peters (No, 69, pag. 736, pl.).
1882. *Halieutœa senticosa,* (Goode), Jordan & Gilbert (No. 53, pag. 851.
1888. *Dibranchus atlanticus,* (Peters), Vaillant (No. 86, pag. 342).
1895. „ „ (Peters), Goode & Bean (No. 37, pag. 501, fig. 413).
1916. „ „ (Peters), Roule (No. 79 b, pag. 26).
1919. „ „ (Peters), Roule (No. 79 c, pag. 75, pl. V, fig. 5).

1 specimen, 3.6 cm., St. 70, 30/6, N. 42° 59′, W. 51° 15′, 1100 m.

D. 6, A. 4, P. 14, V. 6.

Total length 36 mm.

Length of body (without caudal fin) 27 mm.

Tip of snout to angle of pectoral 17 mm., 63 % of length of body.

Tip of snout to anus 16.5 mm., 61.1 % of length of body.

Greatest width of disc 14.7 mm., 53.7 % of length of body.

Width of disc at origin of the subocular spine 13.9 mm.

Width of the tail 2 mm.

Height of the tail 3 mm.

Tip of snout to dorsal 19 mm., 70.5 % of length of body.

Tip of snout to anal 21.5 mm., 79.7 % of length of body.

Tip of snout to ventral 11 mm., 40.7 % of length of body.

Distance between ventrals 5 mm.; porportion to total length 1 : 7.2.

Tip of snout to eye 2.7 mm.

Interorbital space 2.5 mm., 9.3 % of length of body, proportion to diam. of eye 1 : 1.40.

Diameter of eye 3.5 mm., 13 % of length of body.

Diameter of eye in proportion
to total length 1 : 10.3;
to distance from snout to dorsal 1 : 5.43;
to distance from snout to anal 1 : 6.14;
to distance from snout to angle of pectoral 1 : 4.86;
to distance from snout to base of ventral 1 : 3.14;
to greatest width of disc 1 : 4.14;
to width of the tail 1 : 0.57.

In the specimen described by PETERS, the disc is broader than long (No. 69, pag. 738); in the present one, however, it is longer than it is broad, and the greatest breadth is slightly in front of the subopercular spine at its posterior corner; moreover, the contour of the disc between this and the pectoral fin points towards the caudal fin, whereas in PETERS' figure, it points more or less straight in towards the body, as nearly as possible towards the dorsal fin. The outline thus is more egg-shaped than in PETERS' figure. This difference in shape is apparently due to mobility between the opercular bones. GOODE and BEAN's description also gives another shape of disc than PETERS', the disc being stated to be nearly as wide as long. The eye is relatively larger than noted by PETERS and GOODE and BEAN, but the specimens described by PETERS and GOODE and BEAN are twice and four times as large respectively as the present specimen.

The diameter of the eye, it should be noted, exceeds the interorbital space and is also greater than the distance from the eyes to the point of the rostrum. The rostrum points slightly upwards, but yet prevents the mouth from being visible from above. The width of the mouth is hardly 1½ times diameter of eye. The feeler under the rostrum is three-lobed; between it and the eye are the nostrils.

The tail is shorter than the disc and broader than it is high.

Some of the spines in the margin of the disc are three-pointed, and some of those in the row beneath have two points. The spines have a radial base, but the radial keels are not armed with spicules or have but a slight indication of such.

## SUBORDER PLECTOGNATHI.

### *Tetrodontidæ.*

***Tetrodon spengleri,*** Bloch.

1785. *Tetrodon spengleri,* Bloch (No. 4, ausländ. I, pag. 135, pl. 144).
1836—44. *Tetrodon marmoratus,* (Lowe), Valenciennes (No. 87, pl. 20, fig, 2).
1870. *Tetrodon spengleri,* (Bloch), Günther (No. 41, VIII, pag. 284).
1893. „ „ (Bloch), Vinciguerra (No. 89, pag. 40).
1919. „ *marmoratus,* (Lowe), Roule (No. 79 c, pag. 63).

2 specimens, 10—12 cm., St. 37, 20/5, N. 26° 6', W. 14° 33', 39 m., shingle.

# LITERATURE.


1 a. ALCOCK, A. A descriptive catalogue of the Indian deep-sea fishes in the Indian Museum collected by the R. I. M. S. ship Investigator. Calcutta 1899.

1 b. ALCOCK, A. Illustrations of the zoology of the Investigator fishes, Calcutta.

2. ANTIPA, G. Die Clupeinen des westlichen Teiles des schwarzen Meeres. Denkschriften d. k. Akad. d. Wissensch. Bd. LXXIII. Wien 1906.

2 a. BARNARD, K. H. Diagnoses of new species of marine fishes from South African waters. An. South African Mus. vol. XIII. Edinburgh 1913–23.

3 a. BEAN, TARLETON, H. New fishes collected off the coast of Alaska and the adjacent region southward. Proceed. U. S. Nat. Mus. vol. 13. Washington 1890.

3 b. BEAN, BARTON, A. and WEED, ALFRED, C. Notes on Anteliochimæra and related genera of chimæroid fishes. Proceed. U. S. Nat. Mus. vol. 37. Washington 1910.

4. BLOCH, M. E. Allgemeine Naturgeschichte der Fische. Naturgeschichte der ausländischen Fische. Berlin 1785—95.

5. BONAPARTE, C. Iconografia della fauna italica. Tome III. Pesci. Roma 1832—41.

6. BORSIERI, CLEMENTINA. Contribuzione alla conoscenza delle specie europee del genere Atherina. Annali di agricoltura 1904. Lavori eseguiti nella r. stazione di piscicoltura. Roma 1904.

7 a. BOULENGER, G. A. Catalogue of the perciform fishes in the British Museum, sec. ed. vol. I. London 1895.

7 b. BOULENGER, G. A. Descriptions of two new deep-sea fishes from South Africa. Marine investigations in South Africa vol. II. Cape Town 1903.

8. BRAUER, AUGUST. Die Tiefsee-Fische. I. Systematischer Teil. Deutsche Tiefsee-Expedition 1898—99. Bd. XV. Jena 1906.

9. COLLETT, R. Norges fiske. Tillægsh. til Vidensk.-Selskap Forh. f. 1874. Christiania 1875.

10. COLLETT, R. Meddelelser om Norges fiske i aarene 1875—78. Vidensk.-Selsk. Forhandl. 1879. Christiania.

11. COLLETT, R. Fishes. The Norwegian North-Atlantic expedition 1876—78. Christiania 1880.

12. COLLETT, R. Meddelelser om Norges fiske i aarene 1879—83. Nyt Magazin for Naturvidenskab. Bd. 29. Christiania 1885.

13 a. COLLETT, R. Diagnoses de poissons nouveaux provenant des campagnes de l'Hirondelle. Bull. Soc. Zool de France. vol. 14. Paris 1889.

13. b. COLLETT, ROBERT. Poissons provenant des campagnes du yacht l'Hirondelle (1885—88). Résultats des campagnes scient. par Albert I de Monaco. Fasc. X. Monaco 1896.

14 a. COLLETT, R. Diagnoses of four hitherto undescribed fishes from the depths south of the Faroe-Islands. Forh. Vidensk.-Selsk. Christiania 1904.

14 b. COLLETT, R. Fiske indsamlede under „Michael Sars"s togter i Nordhavet 1900—1902. Rep. Norweg. Fishery and Marine Investigations vol. II part II (1905). Bergen 1909.

15. CUNNINGHAM, J. T, A treatise on the common sole. Plymouth 1890.

16. CUNNINGHAM, J. T. On secondary sexual characters in the genus Arnoglossus. Proc. Zool. Soc. London 1890.

17. CUVIER, GEORGES. Le règne animal. Les poissons. Paris.

18. CUVIER, G. & VALENCIENNES, M. A. Histoire naturelle des poissons. Paris 1828—49.

19. DAY, FRANCIS. The fishes of Great Britain and Ireland. London 1880—84.

20. DEAN, BASHFORD. On the embryology of Bdellostoma stouti. Festschrift zum siebenzigsten Geburtstag von Carl von Kupffer. Jena 1899.

21. DEAN, BASHFORD. The egg of the hag-fish. Myxine glutinosa, Linnæus. New York Academy of Sciences. Memoirs vol. II part II 1900.

22. DEAN, BASHFORD. Notes on the long-snouted chimæroid of Japan, Rhinochimæra (Harriotta) pacifica (Garman) Mitsukuri. Journ. College Sc., Imper. Univers. Tokyo. Vol. XIX 1904.

23. DEAN, BASHFORD. Chimæroid fishes and their development. Carnegie Institution of Washington Publ.no. 32. 1906.

24. EHRENBAUM, E. Über Fische von Westafrika. „Der Fischerbote" Jahrgang V. Hamburg 1913.

24 a. FAGE, LOUIS. Engraulidæ, Clupeidæ. Rep. Dan. Oceanogr. Expedit. 1908—10. Vol. II. Copenhague 1920.

25. GAIMARD, PAUL. Voyages de la commission scientifique du Nord en Scandinavie, en Laponie, au Spitzberg et aux Feröe pendant les années 1838, 1839 et 1840 sur la corvette la Recherche. Atlas, tome IV, Zoologie. Krøyer, H.: Poissons. 1845.

26. GARMAN, S. Reports on an exploration off the west coast of Mexico, Central and South America and off the Galapagos islands, in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "Albatross" during 1891. XXVI. The fishes. Memoirs of the Museum of Comparative Zoology at Harvard College XXIV. Cambridge, U. S. A., 1899.

27. GARMAN, SAMUEL. The chimæroids especially Rhinochimæra and its allies. Bull. Mus. Comp. Zool. Harvard College vol. XLI no. 2. Cambridge U. S. A., 1904.

28. GEGENBAUR, C. Ueber das Kopfskelet von Alepocephalus rostratus, Risso. Morphologisches Jahrbuch Bd. IV, Supplement. 1878.

29. GIGLIOLI, HENRY H. Di una nuova specie di Macruride appartenente alla fauna abissale del Mediterraneo. Zoologischer Anzeiger Bd. XVI. 1893.

30. GILBERT, CH. H. & CRAMER, FRANK. Report on fishes dredged in deep water near the Hawaiian islands with descriptions and figures of twenty-three new species. Proceed. U. S. Nat. Mus. vol. XIV. Washington 1897.

31. GILBERT, CH. H. The deep-sea fishes in Jordan & Evermann: Aquatic resources of Hawaiian islands. in Bull. U. S. Fish Comm. Vol. XXIII for 1903. Pt. II. Washington 1905.

31 a. GILBERT, CH. H. & HUBBS, C. L. Report on the Japanese Macrouroid fishes collected by the U. S. fisheries steamer "Albatross" in 1906, with a synopsis of the genera. Proceed. U. S. Nat. Mus. vol. LI. Washington 1917.

31 b. GILCHRIST, J. D. F. & von BONDE, C. Deep-sea fishes procured by the S/S "Pickle" (part II) Fisheries and marine biol. survey. Rep. No. 3. for the year 1922. Special reports: No. VII. Union of South Africa. Cape Town 1924.

32. GILL, TH. Diagnoses of new genera and species of deep-sea fish-like vertebrates. Proceed. U. S. National Museum. Vol. VI. 1883. Washington.

33. GILL, TH. and TOWNSEND, CH. H. Diagnoses of new fishes from Bering Sea. Proceed. of the Biolog. Soc. of Washington. XI. 1897.

34. GOODE, G. B. & BEAN, T. H. Description of two gadoid fishes, Phycis chesteri and Haloporphyrus viola, from the deep-sea fauna of the north-western Atlantic. Proceed. U. S. Nat. Mus. vol. I. Washington 1878.

35. GOODE, G. B. & BEAN, T. H. Reports on the results of dredging by the U. S. coast survey steamer "Blake". XIX. Report on the fishes. Bull. Mus. Comp. Zool. Harward College vol. X. Cambridge, U. S. A. 1882—83.

36. GOODE, G. BROWN & BEAN, TARLETON. H. On Hariotta, a new type of chimæroid fish from the deeper waters of the north-western Atlantic. Scientific results of explorations by the U. S. Fish Commis. steamer "Albatross" no. XXX. Proceed. U. S. Nat. Mus. vol. XVII 1894. Washington 1895.

37. GOODE, G. B. & BEAN, T. H. Oceanic ichthyology. Washington 1895.

38. GRIEG, J. A. Ichthyologiske notiser III. Bergens Museums Aarbok 1911.

39. GRUVEL, A. L'Industrie des pêches sur la côte occidentale d'Afrique. Paris 1913.

40. GUNNERUS. Efterretning om berglaxen. Det Trondhjemske Vidensk. Selsk. Skrifter. Bd. III. Kjøbenhavn 1765.

41. GÜNTHER, A. Catalogue of the fishes in British Museum. Vol. I-VIII.

42. GÜNTHER, A. Preliminary notices of deep-sea fishes collected during the voyage of H. M. S. Challenger. Ann. Mag. Nat. Hist. Ser. V. vol. II. London 1878.

43. GÜNTHER, A. Report on the deep-sea fishes collected by H. M. S. Challenger. 1887.

44. GÜNTHER, A. Report of a deep-sea trawling cruise off the S. W. coast of Ireland. Ann. Mag. Nat. Hist. Ser. VI. Vol. IV. London 1889.

45. GÜNTHER, A. A contribution to our knowledge of British Pleuronectidæ. Proc. Zool. Soc. London 1890.

46 a. HECTOR, JAMES. Descriptions of five new species of fishes obtained in the New-Zealand seas by H. M. S. "Challenger" expedition July 1874. Ann. Mag. Nat. Hist. Ser. IV. Vol. XV. 1875.

46 b. HOLT, E. W. L. & CALDERWOOD, W. L. Survey of fishing-grounds, west coast of Ireland. 1890—91. Report on the rarer fishes. Scientific. Transactions Roy. Soc. Vol. V. Ser. II. Dublin 1895.

47. HOLT, B. W. L. & BYRNE, L. W.: First report on the fishes of the Irish Atlantic slope. Fisheries Ireland, Sci. Invest. 1905 II (1906).

48. HOLT, E. W. L. & BYRNE, L. W. Second report on the fishes of the Irish Atlantic slope. Fisheries, Ireland. Sci. Invest. 1906, V. 1908.

49. HOLT, E. W. L. & BYRNE, L. W. Third report on the fishes of the Irish Atlantic slope. The Holocephali or Chimæras. Fisheries, Ireland, Sci. Invest. 1908 IV. Dublin 1910.

50 a. JENSEN, A. S. Om Slimaalens æg. Vidensk. Meddel. fra Naturh. Foren. København 1900.

50 b. JENSEN, A. S. The north-European and Greenland Lycodinæ. The Danish Ingolf-Expedition. Copenhagen 1904.

51. JENSEN, A. S. Raia fyllæ i Skagerak. Vidensk. Meddel. fra Naturh. Foren. København 1905.

52. JENSEN, A. S. The Selachians of Greenland. Mindeskrift for Japetus Steenstrup. København 1914.

53. JORDAN, D. S. and GILBERT, CH. H. Synopsis of the fishes of North America. Bull. U. S. Nat. Mus. No. 16. Washington 1882.

54. JORDAN, D. S. A catalogue of the fishes known to inhabit the waters of North America, north of the tropic of Cancer. Ann. rep. U. S. Fish Comm. for 1885 XIII. Washington 1887.

55. JORDAN, D. S. and DAVIS, BRADLEY MOORE. A preliminary review of the apodal fishes or eels inhabiting the waters of America and Europe. Ann. rep. U. S. Fish Comm. for 1888. Washington 1892.

56. JORDAN, D. S. & EVERMANN, B. W. The fishes of North and Middle America. Bull. U. S. Nat. Mus. No. 47. Washington 1900.

56 a. JORDAN, D. S. & THOMPSON, W. F. Record of the fishes obtained in Japan in 1911. Memoirs Carnegie Mus. Pittsburgh. Vol. VI no. 4. Pittsburgh 1914.

57. KOEHLER, R. Poissons. Résultats scientifiques de la campagne du "Caudan". Paris 1896.

58. KRØYER, HENRIK. Danmarks fiske. Kjøbenhavn 1838—53.

59. KYLE, H. M. Flat-fishes (Heterosomata). Rep. Danish Oceanogr. Exped. 1908—10 to the Mediterranean. Vol. II. Biology. A 1. Copenhagen 1913.

60. LEA, EINAR. Murænoid larvæ. Rep. sc. results "Michael Sars" North Atlantic deep-sea exp. 1910. vol. III. part I. Bergen.

61. LILLJEBORG, W. Sveriges och Norges fiskar. Upsala 1891.

61 a. LLOYD, R. E. Notes on the skull of the genus Aulastomatomorpha with description of some new deep-sea fishes, Ann. Mag. Nat. Hist. Ser. VII vol. XVIII. London 1906.

61 b. LLOYD, R. E. A description of the deep-sea fish caught by the R. I. M. S. ship "Investigator" since the year 1900. Memoirs of the Indian Museum vol. II. 1909—10. Calcutta.

62. LOWE, R. T. A history of the fishes of Madeira. London 1843—60.

63. LÜTKEN, CHR. Korte bidrag til nordisk Ichthyografi II. Notacanthus nasus Bloch. (Otto Fabricius's Campylodon eller "Bugtetand"). Videnskab. Meddel. Naturhist. Foren. Kjøbenhavn for 1877 og 1878.

64. LÜTKEN, CHR. Korte bidrag til nordisk Ichthyographi VI. Vidensk. Meddel. Naturh. Foren. Kjøbenhavn for 1887.

65. LÜTKEN, CHR. Korte bidrag til nordisk Ichthyographi VII. Vidensk. Meddel. Naturh. Foren. Kjøbenhavn for 1891.

66. LÜTKEN, CHR. The ichthyological results. The Danish Ingolf-Expedition vol. 2, I. Copenhagen 1898.

67. MOREAU, E. Histoire naturelle des poissons de la France I—III. Paris 1881. Supplément Paris 1891.

68. MÜLLER, J. and HENLE, J. Systematische Beschreibung der Plagiostomen. Berlin 1841.

69. PETERS, W. Eine neue mit Halieutaea verwandte Fischgattung, Dibranchus, aus dem atlantischen Ocean. Monatsber. kön. Preuss. Akad. Wissenschaften zu Berlin. Aus dem Jahre 1875. Berlin 1876.

70. PIETSCHMANN, VIKTOR. Ichthyologische Ergebnisse einer Reise nach Island, an die atlantische Küste von Marokko und die westliche Hälfte des Mittelmeeres. Annalen des kk. naturhistorischen Hofmuseums Bd. XXI 1906. Wien.

71. REGAN, C. TATE. A synopsis of the sharks of the family Scylliorhinidæ. Ann. Mag. Nat. Hist. Ser. VIII. Vol. I. London 1908.

72. REGAN, C. TATE. A synopsis of the sharks of the family Squalidæ. Ann. Mag. Nat. Hist. Ser. VIII. vol. II. London 1908.

73. REGAN, C. TATE. The osteology and classification of the teleostean fishes of the order Apodes. Ann. Mag. Nat. Hist. Ser. VIII. vol. X. London 1912.

74. REGAN, C. TATE. The antarctic fishes of the Scottish National Antarctic Expedition. Transactions Roy. Soc. Edinburgh. XLIX. pt. II 1913.

75. REINHARDT, JOH. Ichtyologiske Bidrag til den grønlandske Fauna. Det Kgl. Danske Videnskab. Selskabs naturvidenskab. og mathemat. Afhandl. VII Del. Kjøbenhavn 1838.

76. RISSO, A. Ichthyologie de Nice. Paris 1810.

77. RISSO, A. Histoire naturelle des principales productions de l'Europe méridionale et particulièrement de celles des environs de Nice et des Alpes maritimes. Tome III. Paris 1826.

78. RISSO, A. Observations sur quelques poissons de la mer de Nice. Wiegmann's Archiv für Naturgeschichte. Jahrg. VI. Bd. I. Berlin 1840.

79 a. ROULE, LOUIS. Considérations sur les genres Xenodermichthys, Günth, et Aleposomus, Gill dans la famille des Alépocéphalidés. Bull. Mus. National Hist. Nat. Paris 1915.

79 b. ROULE, LOUIS. Notice préliminaire sur quelques espèces nouvelles ou rares des poissons provenant des croisières de S. A. S. le Prince de Monaco. Bull. Inst. Océanogr. nr. 320. Monaco 1916.

79 c. ROULE, LOUIS. Poissons provenant des campagnes du yacht Princesse Alice (1891—1913) et du yacht Hirondelle II (1914) Résultats des campagnes scientifiques . . . par Albert Ier . . . de Monaco. Fasc. LII. Monaco 1919.

80. SCHMIDT, JOHANNES. Gadiculus argenteus and Gadiculus thori. Særtryk af Mindeskrift for Japetus Steenstrup. Kjøbenhavn 1913.

81. SMITH, A. Illustrations of the zoology of South Africa. Pisces. London 1849.

82. SMITT, F. A. Skandinaviens fiskar. Andra Upplagen. Stockholm 1895.

83. STEINDACHNER, FRANZ. Ichthyologischer Bericht über eine nach Spanien und Portugal unternommene Reise (sechste Fortsetzung). Sitzungsber. math.-naturw. Classe kaiserl. Akad. Wissenschaften. Bd. LVII. Abt. I. Wien 1868.

84. SÆMUNDSSON, B. Zoologiske meddelelser fra Island. XII. Vidensk. Meddel. Naturh. Foren. Bd. 65. Kjøbenhavn 1912.

85. TANAKA, SHIGEHÓ. Descriptions of one new genus and ten new species of Japanese fishes. Journ. Coll. Science Imper. Univers. Tokyo. vol. XXVII. Tokyo 1909.

86. VAILLANT, L. Poissons. Expeditions scientifiques du Travailleur et du Talisman. Paris 1888.

87. VALENCIENNES, M. A. Ichthyologie des îles Canaries in Barker-Webb & Berthelot. Histoire naturelle des îles Canaries. Tome II. 2eme partie. Paris 1836—44.

88. VINCIGUERRA, D. Appunti ittiologici II. Intorno ai Macrurus del Golfo di Genova. Annali del Museo Civico vol. XIV. 1879, Genova.

89. VINCIGUERRA, D. Catalogo dei pesci delle isole Canarie. Atti Soc. Ital. di Scienze Nat. Milano XXXIV 1892-1893.

90. WEBER, MAX. Die Fische der Siboga-Expedition. Uitkomsten op zoologisch, botanisch, oceanographisch en geologisch Gebied verzameld in Nederlansch. Oost-Indie 1899—1900. Leiden 1913.

91. WINTHER, G., HANSEN, H. J. & JENSEN, AD. S. Zoologia Danica. Bd. II. Fiske. København 1878—1907.

92. ZUGMAYER, E. Poissons provenant des campagnes du yacht Princesse-Alice 1901—10. Résultats des campagnes scientifiques par Albert Ier. Fasc. XXXV. Monaco 1911.

# INDEX TO THE DESCRIPTIONS.

*Acanthonus armatus*, GÜNTH. ..... 141
*Alepocephalus agassizii*, G. & B. ..... 36
„ *giardi*, KOEHLER ..... 35
„ *macrolepis*, n. sp. ..... 44
„ *macropterus*, VAILL. ..... 40
„ *hjorti*, n. sp. ..... 43
„ *murrayi*, n. sp. ..... 41
„ *productus*, GILL ..... 38
„ *rostratus*, RISSO ..... 34
„ *australis*, BARNARD ..... 39
*Antimora rostrata*, GÜNTH. ..... 118
*Arnoglossus imperialis*, RAF. ..... 129
„ *laterna*, WILLUGHBY ..... 129
„ *thori*, KYLE ..... 129
*Argentina silus*, NILSS. ..... 34
„ *sphyræna*, LIN. ..... 33
*Atherina presbyter*, CUV. & VAL. ..... 76

*Bathygadus arcuatus*, G. & B. ..... 114
„ *longifilis*, G. & B. ..... 116
„ *melanobranchus*, VAILL. ..... 112
„ *sp. (favosus*, G. & B.?) ..... 114
*Bathymicrops regis*, n. g., n. sp. ..... 64
*Bathypterois dubius*, VAILL. ..... 63
„ *longipes*, GÜNTH. ..... 63
*Bathysaurus ferox*, GÜNTH. ..... 62
„ *mollis*, GÜNTH. ..... 62
*Bathytroctes alvifrons*, GARMAN ..... 45
„ *michaelsarsi*, n. sp. ..... 48
„ *nasutus*, n. sp. ..... 50
„ *rostratus*, GÜNTH. ..... 51
*Benthosaurus grallator*, G. & B. ..... 64
*Box vulgaris*, CUV. & VAL. ..... 127

*Callionymus maculatus*, BONAP. ..... 133
*Cantharus lineatus*, MONTAGU ..... 127
*Capros aper*, LACÉP. ..... 128
*Caranx trachurus*, LIN. ..... 128
*Carcharodon sp.* ..... 21
*Careproctus reinhardti*, KR. ..... 132
*Catætyx laticeps*, n. sp. ..... 137
*Centriscus scolopax*, LIN. ..... 76
*Chimæra mirabilis*, COLL. ..... 29
„ *monstrosa*, LIN. ..... 29
*Chrysophrys aurata*, CUV. & VAL. ..... 128
*Clupea alosa*, LIN. ..... 33
„ *pilchardus*, WALB. ..... 33
„ *(Sardinella) granigera*, CUV. & VAL. ..... 33
*Coris julis*, LIN. ..... 128
*Cottunculus microps*, COLL. ..... 131
„ *thomsonii*, GÜNTH. ..... 131

*Dentex macrophthalmus*, CUV. & VAL. ..... 126
„ *maroccanus*, CUV. & VAL. ..... 127
„ *vulgaris*, CUV & VAL. ..... 126
*Diagramma mediterraneum*, GUICHENOT ..... 126
*Dibranchus atlanticus*, PETERS ..... 141
*Dicrolene intronigra*, G. & B. ..... 134

*Engraulis encrasicholus*, CUV. ..... 33

*Gadiculus argenteus*, GUICHENOT ..... 118
„ *thori*, SCHMIDT ..... 118
*Gadus callarias*, LIN. ..... 116
„ *esmarki*, NILSS. ..... 118
„ *luscus*, LIN. ..... 117
„ *merlangus*, LIN. ..... 117
„ *poutassou*, RISSO ..... 118
„ *æglefinus*, LIN. ..... 117

*Halosauropsis macrochir*, GÜNTH. ..... 65
*Halosaurus johnsonianus*, VAILL. ..... 67
*Harriotta raleighana*, G. & B. ..... 29
*Hippoglossus vulgaris*, FLEM. ..... 129
*Histiobranchus bathybius*, GÜNTH. ..... 60
*Holcomycteronus digittatus*, GARMAN ..... 140
*Hoplostethus mediterraneum*, CUV. & VAL. ..... 125

*Ilyophis brunneus*, GILB. ..... 61

*Lepidion eques*, GÜNTH. ..... 124
*Lepidopus caudatus*, EUPHR. ..... 129
*Lepidorhombus boscii*, RISSO ..... 129
„ *megastoma*, DONOV. ..... 129
*Lepidotrigla aspera*, CÜV. & VAL. ..... 132
*Lophius piscatorius*, LIN. ..... 141
*Lycenchelys muræna*, COLL. ..... 136
*Lycodes lütkenii*, COLL. ..... 135
„ *pallidus*, COLL. ..... 135
„ *terræ novæ*, COLL. ..... 134
*Lycodonus flagellicauda*, JENSEN ..... 136
„ *mirabilis*, G. & B. ..... 137

*Macdonaldia rostrata*, COLL. ..... 74
„ *sp.* ..... 71
*Macrurus asperrimus*, VAILL. ..... 93
*Macrurus carapinus*, G. & B. ..... 107
„ *(Cetonurus) sp.* ..... 96
„ *(Chalinura) brevibarbis*, G. & B. ..... 105
„ „ *murrayi*, GÜNTH. ..... 103
„ „ *simulus*, G. & B. ..... 100
„ *(Coelorhynchus) coelorhynchus*, RISSO ..... 83
„ *(Coelorhynchus) talismani*, COLL. ..... 78

*Macrurus (Coryphænoides) rupestris*, GUNN. ..... 91
„ *flagellicauda*, n. sp. ..... 99
„ *güntheri*, VAILL. ..... 87
„ *(Malacocephalus) lævis*, LOWE ..... 109
„ *(Nematonurus) armatus*, HECTOR ..... 109
„ *sclerorhynchus*, VAL. ..... 84
„ *zaniophorus*, VAILL. ..... 86
„ *æqualis*, GÜNTH. ..... 84
*Merluccius vulgaris*, FLEM. ..... 118
*Mixonus laticeps*, GÜNTH. ..... 133
*Molva elongata*, RISSO ..... 118
*Monomitopus torvus*, GARMAN ..... 138
*Mora mora*, RISSO ..... 124
*Mullus surmuletus*, LIN. ..... 128
*Muræna helena*, LIN. ..... 62
*Mustelus vulgaris*, MÜLL. & HENLE ..... 21
*Myliobatis aquila*, CUV. ..... 29
*Myxine glutinosa*, LIN. ..... 18

*Narcetes pluriserialis*, GARMAN ..... 54
*Neobythites crassus*, VAILL. ..... 133
*Notacanthus sp.* ..... 67

*Oculospinus brevis*, n. g., n. sp. ..... 139
*Onos reinhardti*, KR. ..... 118
*Oxynotus centrina*, RAFIN. ..... 21
*Oxyrhina sp.* ..... 21

*Pagellus acarne*, CUV. & VAL. ..... 128
„ *centrodontus*, CUV. & VAL. ..... 128
*Pagrus vulgaris*, CUV. & VAL. ..... 128
*Peristedion cataphractum*, CUV. & VAL. ..... 132
*Phycis blennioides*, BRÜNN. ..... 123
*Platytroctes apus*, GÜNTH. ..... 58
*Pristipoma bennettii*, LOWE ..... 125
*Pristiurus melanostomus*, BONAP. ..... 21

*Raia alba*, LACÉP. ..... 26
„ *circularis*, COUCH ..... 28
„ *clavata*, LIN. ..... 24
„ *fullonica*, LIN. ..... 29
„ *fyllæ*, LÜTK. ..... 27
„ *hyperborea*, COLL. ..... 24
*Raia microocellata*, MONTAGU ..... 26
„ *miraletus*, LIN. ..... 27
„ *nidrosiensis*, COLL. ..... 29
„ *punctata*, RISSO ..... 24
„ *vomer*, FRIES ..... 28
*Rhina squatina*, DUMERIL ..... 21
*Rhinochimæra atlantica*, HOLT & BYRNE ..... 32

*Sargus annularis*, CUV. & VAL. ..... 127
„ *rondeletii*, CUV. & VAL. ..... 127
*Sciæna aquila*, LACÉP. ..... 125
*Scorpæna cristulata*, G. & B. ..... 131
„ *scrofa*, LIN. ..... 130
„ *ustulata*, LOWE ..... 130
*Scylliorhinus atlanticus*, n. sp. ..... 18
„ *caniculus*, LIN. ..... 21
*Sebastes dactylopterus*, DE LA ROCHE ..... 130
*Serranus cabrilla*, LIN. ..... 125
*Solea lutea*, RISSO ..... 130
„ *variegata*, DONOV. ..... 130
„ *vulgaris*, QUENSEL ..... 130
*Spinax niger*, BONAP. ..... 21
„ *princeps*, COLL. ..... 21
*Squalus acanthias*, LIN. ..... 21
*Stephanoberyx gillii*, G. & B. ..... 65
*Synaphobranchus pinnatus*, GRON. ..... 58

*Talismania mollis*, KOEHLER ..... 55
*Temnodon saltator*, CUV. & VAL. ..... 129
*Tetrodon spengleri*, BLOCH ..... 142
*Trachinus draco*, LIN. ..... 132
„ *vipera*, CUV. & VAL. ..... 132
*Trachyrhynchus trachyrhynchus*, RISSO ..... 76
*Trigla cuculus*, BLOCH ..... 132
„ *gurnardus*, LIN. ..... 132
„ *hirundo*, BLOCH ..... 132
„ *lyra*, LIN. ..... 132
„ *obscura*, LIN. ..... 132
„ *pini*, BLOCH ..... 132

*Umbrina ronchus*, VAL. ..... 125
*Uranoscopus scaber*, LIN. ..... 132

*Zeus faber*, LIN. ..... 129

# EXPLANATION OF THE PLATES.

## Plate I.

1. *Alepocephalus macropterus,* Vaillant, 20.5 cm., St. 25.
2. „ *rostratus,* Risso, 31.5 cm., St. 23.
3. *Chimæra mirabilis,* Collett, 71 cm., St. 4.

## Plate II.

1. *Macrurus æqualis,* Günther, 23 cm., St. 41.
2. *Synaphobranchus pinnatus,* Gronovius, 31 cm., St. 41.
3. *Lycodes terræ novæ,* Collett, 11 cm., St. 70.

## Plate III.

1. *Harriotta raleighana,* Goode & Bean, 74 cm., St. 101.
2. „ „ „ 27 cm., St. 35.
3. *Scylliorhinus atlanticus,* n. sp., 25 cm., St. 41.
4. *Spinax princeps,* Collett, 41 cm., St. 25.
5. *Talismania mollis,* Koehler, abt. 34 cm., St. 25.
6. *Alepocephalus murrayi,* n. sp., 23 cm., St. 35.
7. „ *hjorti,* n. sp., 24 cm., St. 53.
8. „ *macrolepis,* n. sp., 20 cm., St. 48.
9. *Bathytroctes michaelsarsi,* n. sp., abt. 30 cm., St. 53.
10. „ *nasutus,* n. sp., abt. 19 cm., St. 35.

## Plate IV.

1. *Notacanthus sp.,* 64 cm., St. 95.
2. *Macdonaldia sp.,* 32 cm., St. 53.
3. „ *rostrata,* Collett, 29 cm., St. 95.
4. *Bathysaurus ferox,* Günther, abt. 63 cm., St. 95.
5. *Alepocephalus australis,* Barnard ?, abt. 50 cm., St. 95.
6. „ „ „ abt. 23.5 cm., St. 35.
7. *Halosauropsis macrochir,* Günther, abt. 60 cm., St. 95.

## Plate V.

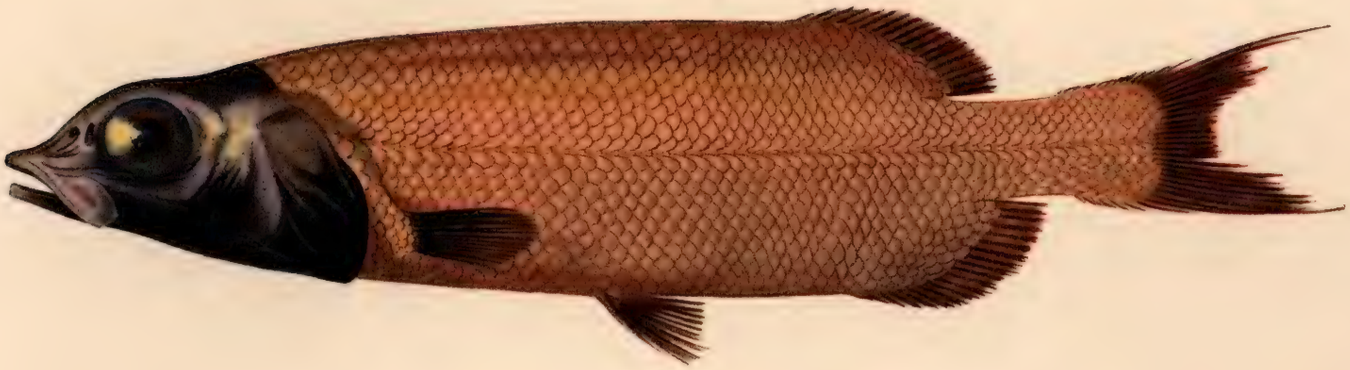
1. *Bathymicrops regis,* n. sp., 11 cm., St. 48.
2. „ „ n. sp., 11 cm., St. 48. The head seen from the side.
3. „ „ n. sp., 11 cm., St. 48. The head seen from above.
4. *Dibranchus atlanticus,* Peters, 3.6 cm., St. 70. Dorsal view.
5. „ „ „ 3.6 cm., St. 70. Ventral view.
6. *Lycodonus mirabilis,* Goode & Bean, 7 cm., St. 70.
7. *Macrurus asperrimus,* Vaillant, 31 cm., St. 41.
8. „ *flagellicauda,* n. sp., abt. 40 cm., St. 88.
9. „ *(Cetonurus) sp.,* abt. 23 cm., St. 41.
10. „ *(Chalinura) brevibarbis,* Goode & Bean, abt. 34 cm., St. 101.

## Plate VI.

1. *Neobythites crassus,* Vaillant, 41 cm., St. 95.
2. *Holcomycteronus digittatus,* Garman, 31 cm., St. 35.
3. *Catœtyx laticeps,* n. sp., 29 cm., St. 41.
4. *Monomitopus torvus,* Garman, 23 cm., St. 41.
5. *Oculospinus brevis,* n. sp., 11 cm., St. 23.
6. *Bathygadus arcuatus,* Goode & Bean, abt. 33 cm., St. 23.

1

2



3

1

2

3

1

2

3

4

5

6

7

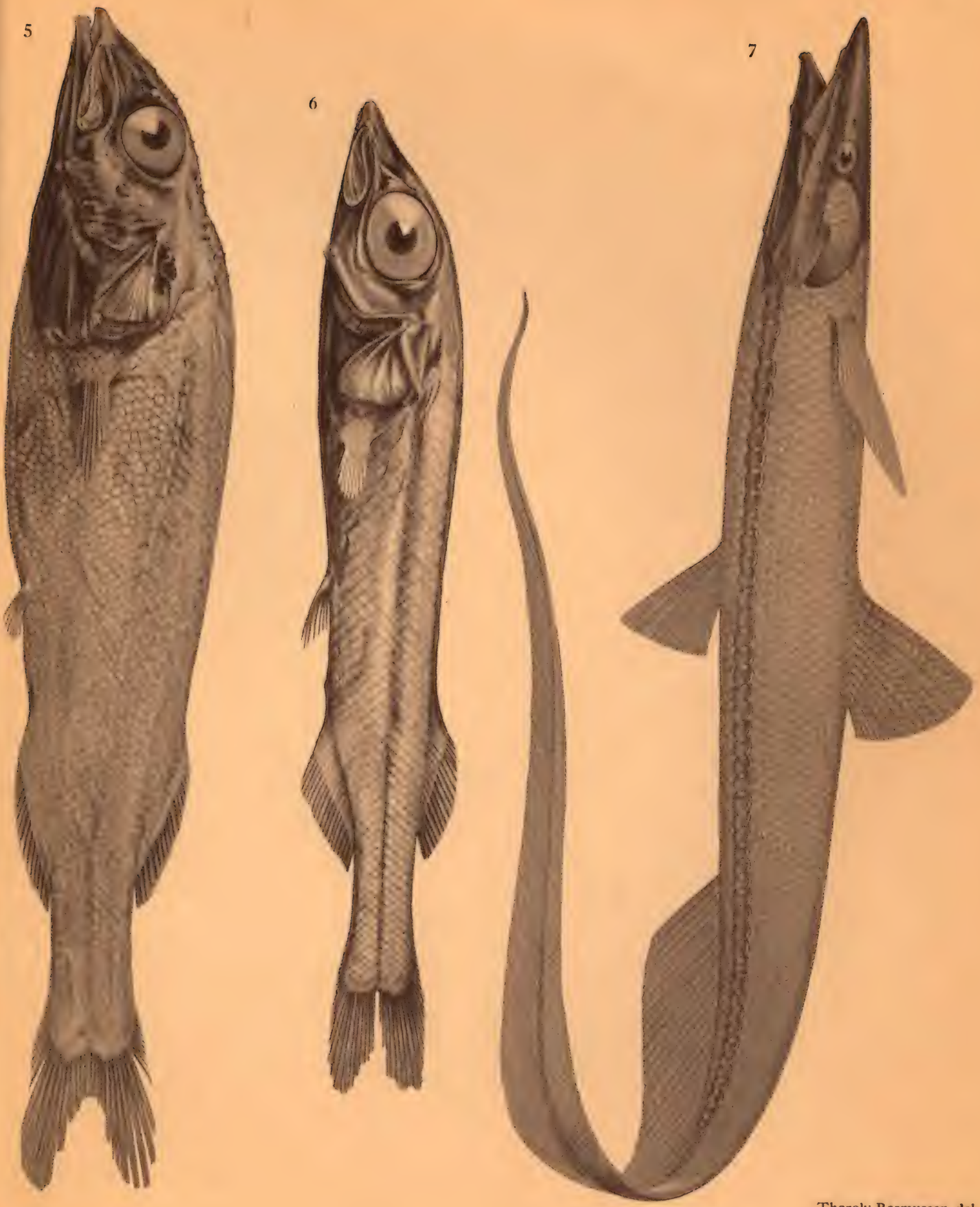
8

9

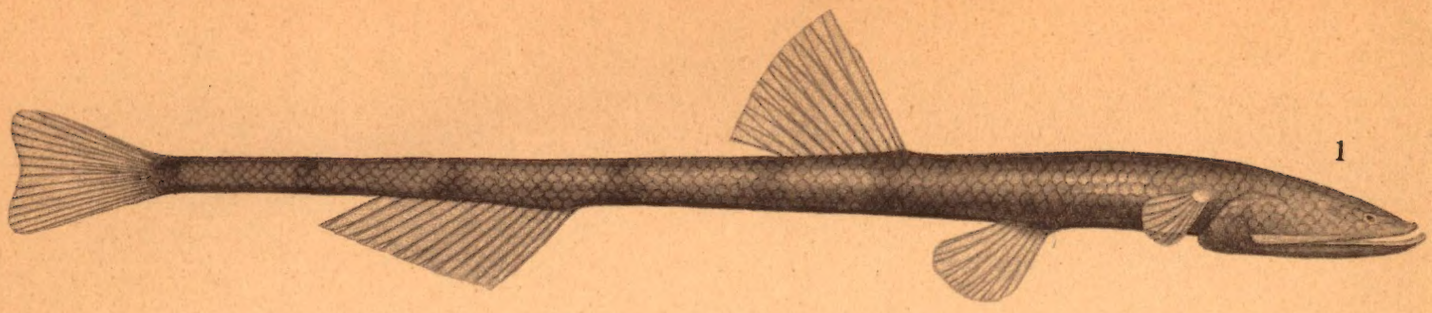
10

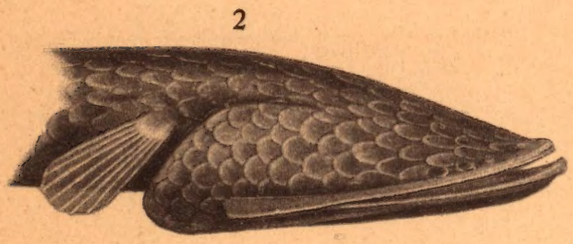
Thorolv Rasmussen del.

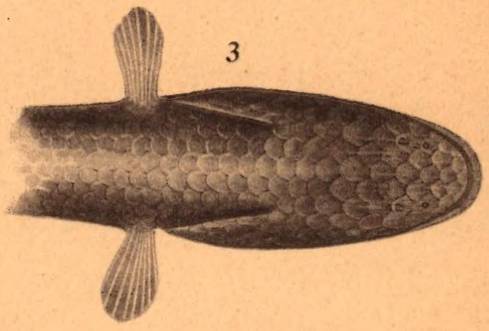
1
2
3
4

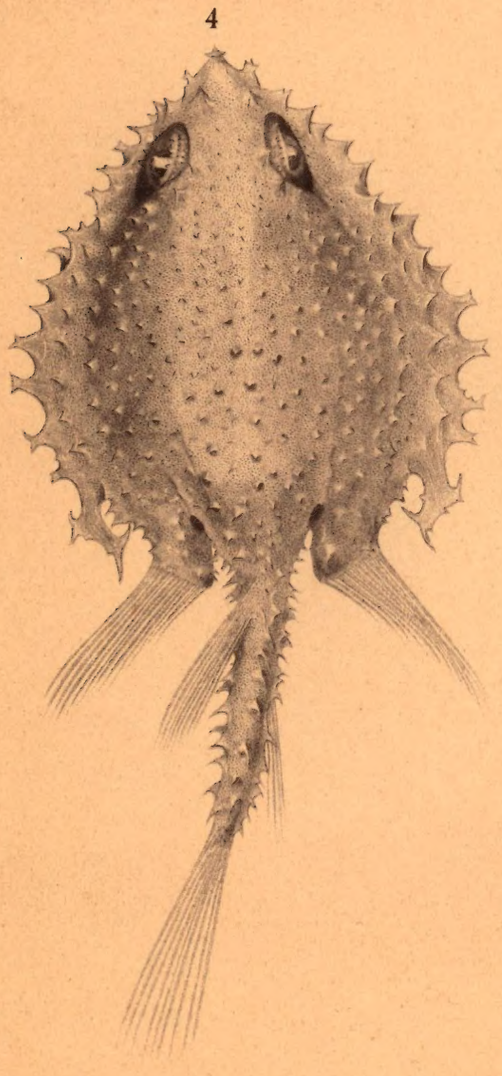


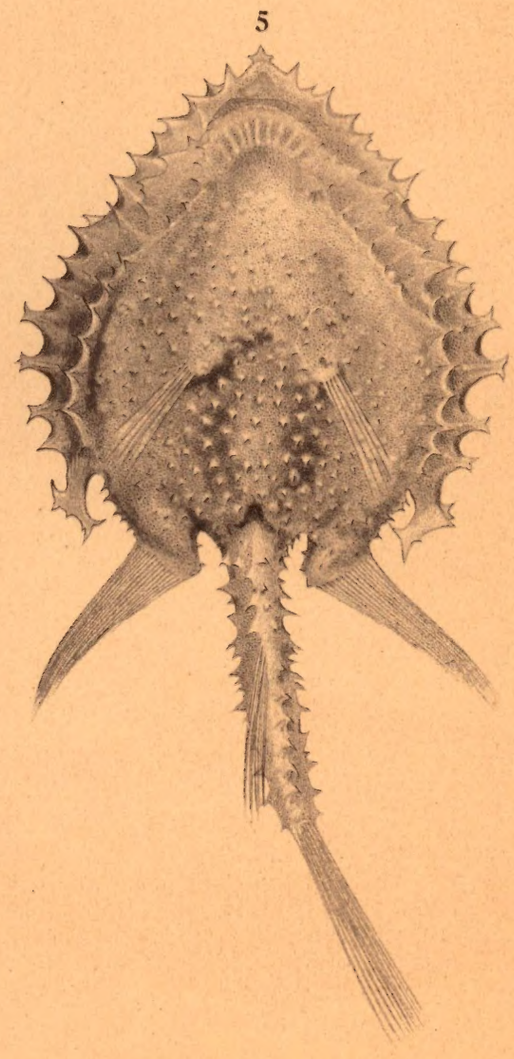

Thorolv Rasmussen del.

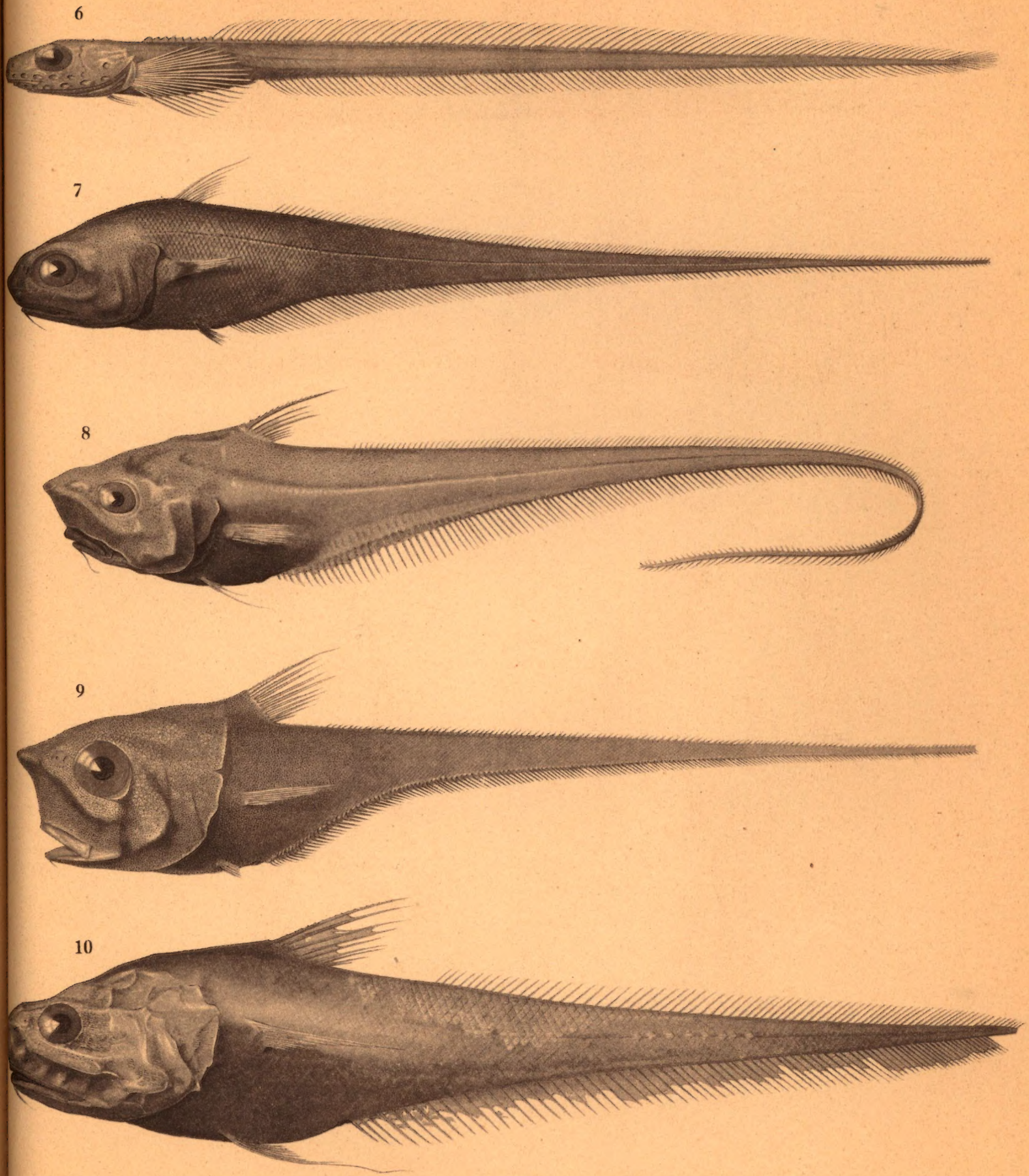

1


2


3

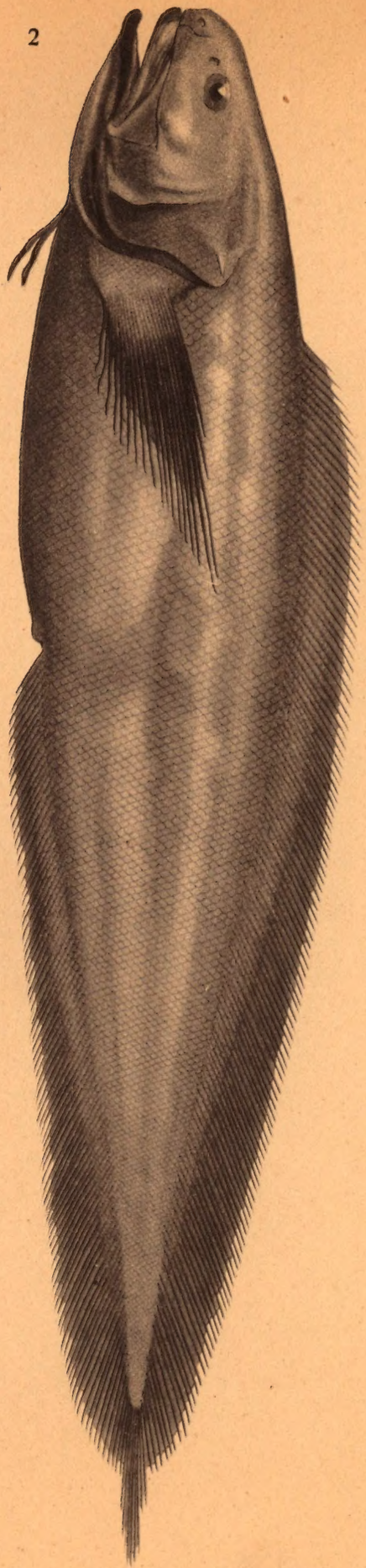

4

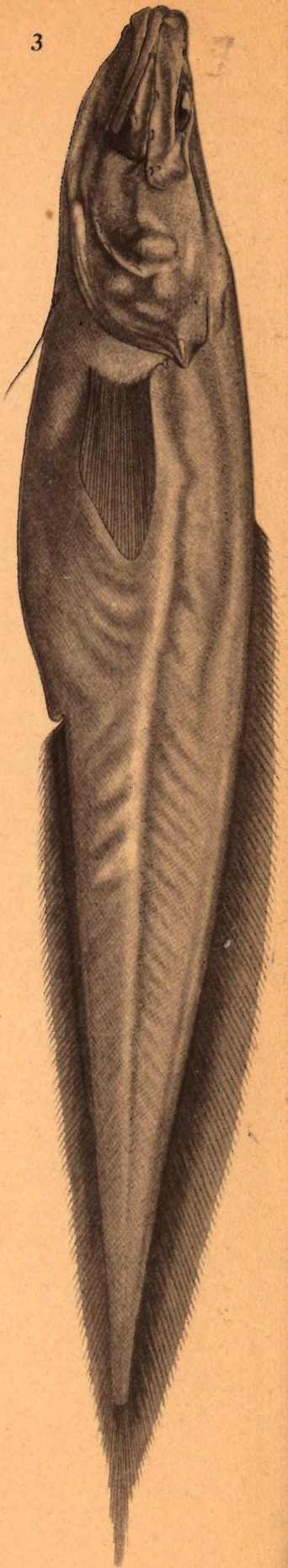

5

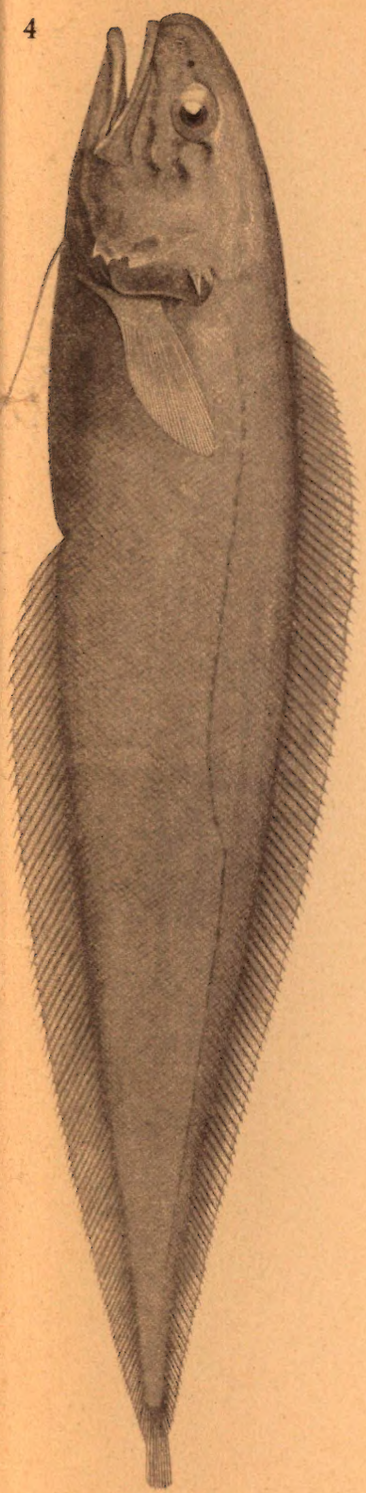


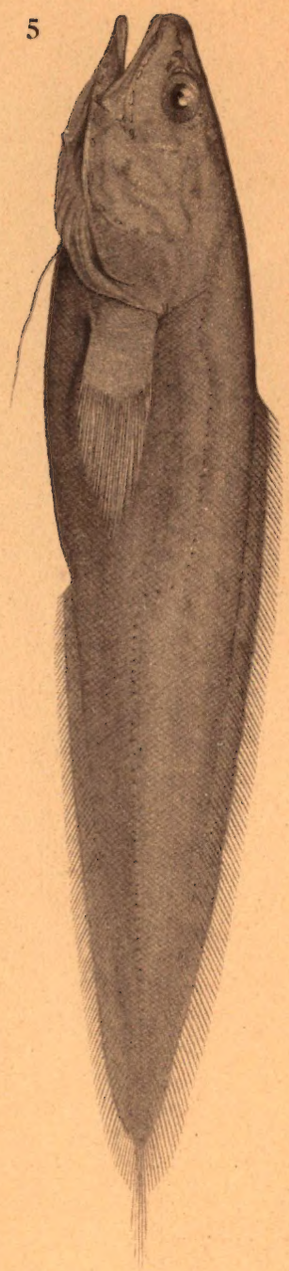

Thorolv Rasmussen del.

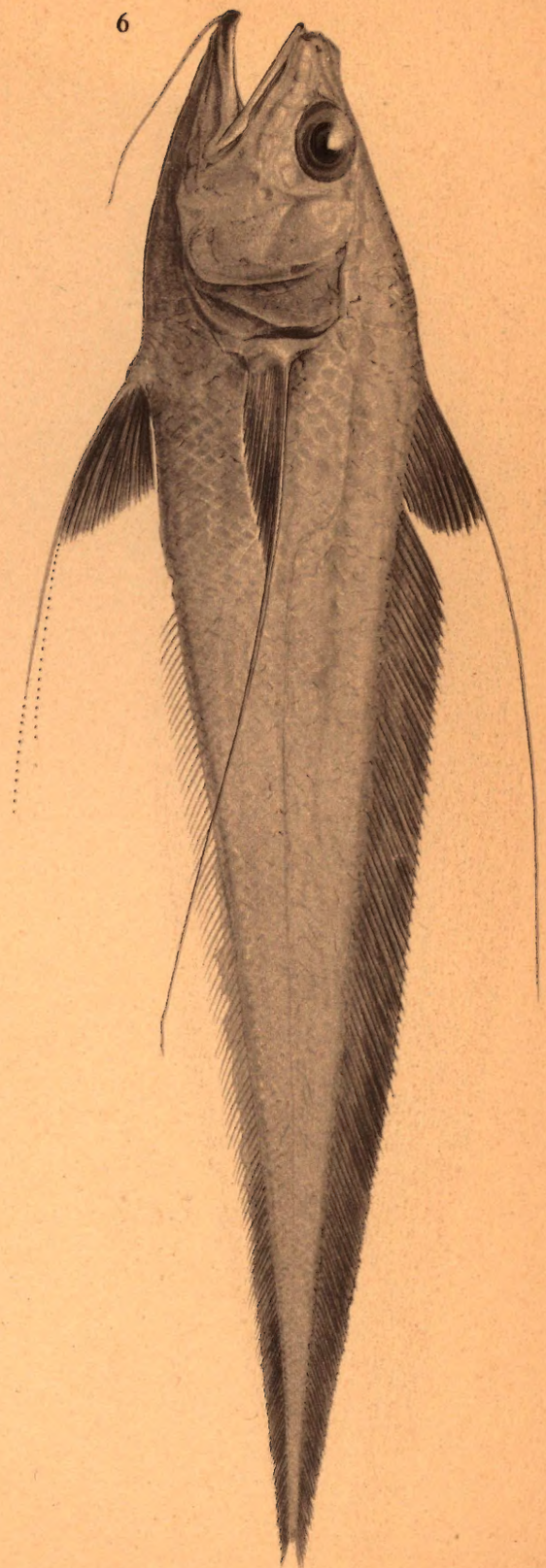
1


2


3




Thorolv Rasmussen del.